MEDICAL DEPARTMENT
UNITED STATES ARMY
IN WORLD WAR II

U. S. Army. Surgeon-General's Office

MEDICAL DEPARTMENT, UNITED STATES ARMY

PREVENTIVE MEDICINE IN WORLD WAR II

Volume V

COMMUNICABLE DISEASES

Transmitted Through

Contact or By Unknown Means

Prepared and published under the direction of

Lieutenant General LEONARD D. HEATON
The Surgeon General, United States Army

Editor in Chief
Colonel JOHN BOYD COATES, Jr., MC

Editor for Preventive Medicine
EBBE CURTIS HOFF, Ph. D., M.D.

Assistant Editor
PHEBE M. HOFF, M.A.

OFFICE OF THE SURGEON GENERAL

DEPARTMENT OF THE ARMY

WASHINGTON, D.C., 1960

PREVENTIVE MEDICINE IN WORLD WAR II

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. Price $5.75

Volume V

COMMUNICABLE DISEASES

Transmitted Through Contact or By Unknown Means

MEDICAL DEPARTMENT, UNITED STATES ARMY

The volumes comprising the official history of the Medical Department of the United States Army in World War II are prepared by The Historical Unit, United States Army Medical Service, and published under the direction of The Surgeon General, United States Army. These volumes are divided into two series: (1) The administrative or operational series; and (2) the professional, or clinical and technical, series. This is one of the volumes of the latter series.

VOLUMES PUBLISHED

ADMINISTRATIVE SERIES

Hospitalization and Evacuation, Zone of Interior

CLINICAL SERIES

Preventive Medicine in World War II:
- Vol. II. *Environmental Hygiene*
- Vol. III. *Personal Health Measures and Immunization*
- Vol. IV. *Communicable Disease Transmitted Chiefly Through Respiratory and Alimentary Tracts*

Surgery in World War II:
- *General Surgery, vol. II*
- *Hand Surgery*
- *Neurosurgery, vol. I*
- *Neurosurgery, vol. II*
- *Ophthalmology and Otolaryngology*
- *Orthopedic Surgery in the European Theater of Operations*
- *Orthopedic Surgery in the Mediterranean Theater of Operations*
- *The Physiologic Effects of Wounds*
- *Vascular Surgery*

Miscellaneous:
- *Cold Injury, Ground Type*
- *United States Army Dental Service in World War II*

Contributors

FREDERIK B. BANG, M.D.
Professor of Pathobiology, School of Hygiene and Public Health, and Associate Professor of Medicine, School of Medicine, Johns Hopkins University, Baltimore, Md. Formerly Major, MC, AUS.

LEONARD A. DEWEY, M.D. (Deceased).
Formerly Colonel, MC, AUS.

JOHN H. DINGLE, M.D., Sc. D.
Elisabeth Severance Prentiss Professor of Preventive Medicine and Associate Professor of Medicine, School of Medicine, Western Reserve University, Cleveland, Ohio. Formerly Lieutenant Colonel, MC, AUS.

JAMES A. DOULL, M.D., Dr. P.H.
Medical Director, Leonard Wood Memorial (American Leprosy Foundation), New York, N.Y. Medical Director (Ret.) U.S. Public Health Service. Formerly Professor of Hygiene and Public Health, School of Medicine, Western Reserve University, Cleveland, Ohio.

JAMES H. DWINELLE, M.D.
Attending Dermatologist, United Hospital, Port Chester, N.Y., and Veterans' Administration Hospital, Bronx, N.Y.; Consulting Dermatologist, St. Luke's Convalescent Hospital, Greenwich, Conn., and St. Vincent's Hospital, Harrison, N.Y. Formerly Lieutenant Colonel, MC, AUS.

ALFRED S. EVANS, M.D.
Director, Division of Preventive Medicine, Associate Professor of Preventive Medicine and of Medical Microbiology, University of Wisconsin School of Medicine, Madison, Wis. Major, MC, USAR.

MALCOLM S. FERGUSON, Ph. D.
Scientist Director, Communicable Disease Center, U.S. Public Health Service, Atlanta, Ga. Formerly Major, SnC, AUS.

HORACE T. GARDNER, M.D.
Chief, Medical Service, Iran Foundation Hospital, Shiraz, Iran. Formerly Major, MC, AUS.

FRANKLIN H. GRAUER, Colonel, MC, USA.
Chief, Dermatology Service, Tripler Army Hospital.

SAMUEL T. HELMS, M.D.
Baltimore, Md. Associated with the Medical School, University of Maryland. Colonel, MC, USAR.

ERNEST B. HOWARD, M.D.
Assistant General Manager, American Medical Association, Chicago, Ill. Formerly Lieutenant Colonel, MC, AUS.

THEODORE H. INGALLS, M.D.
Professor of Preventive Medicine and Epidemiology, University of Pennsylvania School of Medicine, Philadelphia, Pa. Formerly Major, MC, AUS.

RAYMOND A. KELSER, D.V.M., Ph. D. (Deceased).
Formerly Brigadier General, and Chief, Veterinary Division, Office of the Surgeon General; later Dean, School of Veterinary Medicine, University of Pennsylvania, Philadelphia, Pa.

DWIGHT M. KUHNS, M.D.
Director of Laboratories, Harlan Memorial Hospital, Harlan, Ky.; Consultant to Middlesboro, Hazard, Whitesburg, and Wise Memorial Hospitals. Colonel, MC, USA. (Ret.).

DONALD L. LEARNARD, Captain, MSC, USA.

PAUL PADGET, M.D. (Deceased)
Formerly Colonel, MC, AUS.

JOHN R. PAUL, M.D.
Professor of Preventive Medicine, Yale University School of Medicine, New Haven, Conn. Formerly Captain, MRC.

AARON F. RASMUSSEN, Jr., M.D.
Professor of Infectious Diseases and Head of the Division of Virology, School of Medicine, University of California at Los Angeles, Calif. Formerly Captain, MC, AUS.

ALBERT B. SABIN, M.D.
Professor of Research Pediatrics, University of Cincinnati College of Medicine, Cincinnati, Ohio. Formerly Lieutenant Colonel, MC, AUS.

MURRAY SANDERS, M.D.
Research Professor and Director, Department of Microbiology, University of Miami, South Campus, South Miami, Fla. Lieutenant Colonel, MC, AUS (Ret.).

JOSEPH E. SMADEL, M.D.
Associate Director, National Institutes of Health, Bethesda, Md. Formerly Lieutenant Colonel, MC, AUS.

DAVID T. SMITH, M D.
Professor of Microbiology and Associate Professor of Medicine, Duke University School of Medicine, Durham, N.C.

THOMAS H. STERNBERG, M.D.
Professor of Medicine (Dermatology) and Assistant Dean for Postgraduate Medical Education, University of California Medical Center, Los Angeles, Calif. Formerly Lieutenant Colonel, MC, AUS.

CLYDE SWARTZWELDER, Ph.D.
Professor of Medical Parasitology, Louisiana State University School of Medicine, New Orleans, La. Formerly Major, SnC, AUS.

HUGH TATLOCK, M.D., F.A.C.P.
Internist, Northampton, Mass. Formerly Captain, MC, AUS.

THOMAS B. TURNER, M.D.
Professor of Microbiology and Dean of the Medical Faculty, The Johns Hopkins University, Baltimore, Md. Formerly Colonel, MC, AUS.

THOMAS G. WARD, M.D., Dr. P.H.
Professor of Virology, University of Notre Dame, Notre Dame, Ind. Formerly Colonel, MC, AUS.

Foreword

This volume on communicable diseases transmitted through contact or through unknown means is the second volume dealing with communicable diseases, the fourth volume to be published in the preventive medicine series, and the sixteenth volume to be published in the total series dealing with the history of the United States Army Medical Department in World War II. The third volume on communicable diseases, now in preparation, deals with arthropodborne diseases. The highly important diseases transmitted through the respiratory and alimentary tracts have been treated in Volume IV of this series published in 1958.

It was wise selection as well as fortunate chance that placed the late Brig. Gen. James S. Simmons, USA, at the head of the Advisory Editorial Board on the history of Preventive Medicine in World War II. It was equally wise selection and equally fortunate chance that made Brig. Gen. Stanhope Bayne-Jones, USA (Ret.), his successor. Under their sound and inspiring guidance, the entire Editorial Board has worked with interest, enthusiasm, and real efficiency, particularly in the selection of the contributors to the series. The 17 chapters in this book were written by 27 authors, all highly qualified, all with medicomilitary experience during World War II, and all of whom speak with authority in their special fields.

This is a record of past wartime experience, but it has in it the basis of the prevention and control of these special diseases in future wars. To look ahead, as many historians have pointed out, one must first look back. This volume also has in it much of value for civilian preventive medicine in peacetime.

Wars are primarily won or lost by skill at arms, but they may also be won or lost by the success or failure of the methods used to prevent and control disease. It is the ultimate result of the concepts and practices initiated by Maj. Gen. George M. Sternberg, USA, Surgeon General from 1893 to 1902, that the ratio of deaths from disease to deaths from combat injuries fell progressively from 5:1 in the Spanish-American War to 1:1 in World War I and to 0.07:1 in World War II.

In World War II, as in all wars, communicable diseases provided special problems. Some which were no longer of great significance in civilian life became, in effect, occupational diseases in military circumstances. Some diseases which had long been adequately controlled in civilian life in the United States took on new significance when they were encountered in wartime in other parts of the world. Some familiar diseases seemed strangely unfamiliar when they were encountered in foreign lands. Diseases in populations with which Army personnel were in inevitable contact furnished problems in these populations as well as in the Army.

559625ᵛ—61——2

Most of the diseases described in this and other volumes in this series carried a certain mortality, which often was minimal. Even the mildest of them, however, was also associated with what has been well described as "a steady erosion of manpower." Fungus infections furnish an excellent illustration of a group of conditions which, though seldom serious, accounted for a heavy loss of man-days. They existed, in both active and latent forms, in many soldiers when they were inducted. All the wartime circumstances were favorable to recurrence. Numerous fresh infections developed. Methods of prevention which had been regarded as reliable were found to be not only ineffective but potentially harmful. The best methods of treatment were not really satisfactory. The care of these conditions, if only by the sheer weight of their numbers, took up much of the time of medical officers and added to the burden of outpatient clinics and sometimes of hospital services. Slight as these infections usually seemed in civilian life, they incapacitated the soldiers who suffered from them quite as truly as if they had been combat casualties.

Epidemic keratoconjunctivitis is another condition which produced an incredible amount of noneffectiveness. It had incapacitated many thousands of essential skilled workers in war plants before its risks were appreciated, and it became evident that the clue to its management was prevention, since there was no really satisfactory treatment. Once its infectiousness was realized, it was rapidly brought under control in affected Army units.

As one turns the pages of this book, certain facts seem to call for mention:

The first, and in many respects the most important, is the homogeneous, cordial, and productive working relation between medical officers responsible for preventive medicine in the Army and their counterparts in civilian practice and the U.S. Public Health Service. One has only to recollect, for instance, the impressive civilian cooperation through the Army Epidemiological Board to realize what this relationship meant. Without it, many of the diseases described in this and other volumes of the preventive medicine series would have presented even more serious problems than they did, and their solutions would have been much longer in coming.

Although a great deal of new and useful information was secured during the war about a number of diseases, some of them still remain mysteries. Geographic areas were added, for instance, to the known distribution of Q fever, but the source of infection and the method of transmission are still to be clarified. On the other hand, because of sound clinical and epidemiological practices employed during the war, light has been shed upon some diseases long after the war. It was 10 years after the 1943 epidemic of Fort Bragg (pretibial) fever that the leptospiral origin of this disease was established by serologic and bacteriologic investigations based upon the wartime practices.

All outbreaks of poliomyelitis during the war were isolated and sporadic, but it is disconcerting as well as surprising to find that the residua of this

disease accounted for the rejection of 1 percent of the men found by induction boards to be unfit for service.

The control of some diseases was not primarily a medical problem but, instead, a command problem. Scabies, for instance, paralleled venereal disease in that its incidence depended upon the incidence in the civilian population and the opportunities for contact and fraternization. Schistosomiasis, of which there were more than 2,500 cases, was originally believed by some line officers, and by a few medical officers, to be of only academic significance. Some soldiers from Puerto Rico with the disease were inducted before the necessity for screening inductees from this area was realized. In the Philippines, the prevention of schistosomiasis was entirely a matter of discipline, which involved keeping the men, their clothing, and anything else connected with them, including their vehicles, out of infected waters.

Yaws was an unimportant disease in the U.S. Army but an extremely important civilian disease in Haiti. A cooperative study showed that it responded promptly to penicillin, which was effective even when the patients were treated on an ambulatory basis. This is but one of the wartime discoveries which has proved of great value in peacetime.

In March 1941, venereal disease was the greatest single cause of noneffectiveness in the U.S. Army, an ironical situation indeed, because it could readily have been prevented and controlled by the means then available. It never ceased to be a problem, and it was often an embarrassing problem. Army philosophy was based on a frank recognition of the fact that an effective fighting force had to be maintained, regardless of moral implications. Prophylactic measures were therefore employed, and policies were varied to suit the conditions encountered in various theaters. This philosophy was in direct conflict with that of certain civilian agencies which were cooperating—and most cordially and effectively—with the Army. No one was completely satisfied either with the policies employed in World War II or with their results, but, in retrospect, it seems unlikely that anything much better could have been done.

Hepatitis furnished the most unexpected, and perhaps the most serious, problem of all the diseases discussed in this volume. Although this was an "old and ugly camp follower," neither its enormous incidence nor its serious potentialities had been foreseen by any medical authorities before the war. Then, 4 months after Pearl Harbor, came the "bombshell" of epidemic serum hepatitis, caused by the use of icterogenic human serum in certain lots of yellow fever vaccine. During 1943, in the midst of hard combat in the North African theater, medical officers were suddenly confronted with another type of hepatitis, the infectious variety, whose victims filled to overflowing the hospitals just to the rear of the combat area. Up to 1942, there had been no general realization of the possible dual character of hepatitis. How the disease was spreading in this epidemic was not understood. No methods of

prevention were known. No specific therapy was available. The experience was both colored and confused by the recent experience with serum hepatitis. A previous attack of that variety of hepatitis apparently furnished no immunity at all. This epidemic in North Africa was an outstanding example of what can happen when susceptible troops, during the summer, occupy an endemic area, as the eastern half of the Mediterranean littoral proved to be. There were later epidemics of infectious hepatitis in the Mediterranean theater, in the Middle East, in the European theater, and in the Pacific, but none so devastating from every standpoint as this first outbreak of serum hepatitis in 1942.

Three commissions working under the auspices of the Army Epidemiological Board took up the investigation, with the main objective of determining methods of spread and devising methods of control. The knowledge gained was sparse, in view of the magnitude of the problem, and there are many questions about infectious hepatitis which still require answers.

The responsibility for the history of the United States Army Medical Department in World War II was assumed by The Surgeon General of the Army in 1944. It is an important phase of his overall responsibility. In writing the foreword for this volume, the first to appear during my tour of duty, I gladly assume the task, and I pay tribute to all of those who have written and produced this volume and the other published volumes in the series, and who are at work on the volumes still to be published.

LEONARD D. HEATON,
Lieutenant General,
The Surgeon General.

Preface

The objectives of this volume of the preventive medicine series of the history of the Medical Department are identical with those of volume IV of the series, Communicable Diseases Transmitted Chiefly Through Respiratory and Alimentary Tracts; namely, to present historically the importance of communicable diseases as a hazard in the operations of the U.S. Army during World War II and to characterize definitively military problems of these diseases as distinct from those encountered in civil life. Such a historical record is significant not only as a careful and critical analysis of past events but also as a unique resource in formulating judgments and decisions for the future. There is a tendency in times of great stress to neglect the experiences of the past and so to make errors of policy that might be avoided. It is hoped that this volume, through its lucid analysis of the problems of communicable diseases transmitted through contact or unknown portals of entry in the U.S. Army in World War II, will permit a more intelligent approach to such dangers as they may be encountered in the future.

The chronological scope of this history covers events in World War II up to 1 January 1946. Inasmuch as all of the chapters have been written at varying times since then, the presentation takes account of advances in knowledge made after that date. Each author has prepared his chapter from the point of view of contemporary understanding of his subject at the time of writing.

Grateful thanks are expressed to the authors for their generous response to the invitations of The Surgeon General to prepare chapters in this volume. Their willingness to accept this task makes it possible to present a historical document which reflects experience and distinction in their special fields. As in the case of previously published volumes of this series, it is appropriate to recognize the overall planning and supervision of the Advisory Editorial Board, under the chairmanship of Dr. Stanhope Bayne-Jones. Especial thanks are due to Dr. Bayne-Jones who has reviewed the entire volume and has made available his wide personal knowledge and sound judgment. The members of the board as a group and individually have given liberally of their time in criticizing manuscripts and offering suggestions in many matters of detail.

The authors and editors of this volume appreciate the help derived from all of those who have acted as critical reviewers of the individual chapters—Dr. Donald L. Augustine, Dr. Stanhope Bayne-Jones, Dr. Ernest Carroll Faust, Dr. Quentin M. Geiman, Dr. John E. Gordon, Dr. Frederick A. Johansen, the late Brig. Gen. Raymond A. Kelser, Dr. Anthony J. Lanza, Col. Arthur P. Long, Dr. T. F. McNair Scott, Dr. John R. Paul, Dr. Donald M. Pillsbury, the late Dr. Elliott S. Robinson, the late Brig. Gen. James S.

Simmons, Dr. Wesley Spink, Dr. Thomas B. Turner, Dr. Willard H. Wright, and Col. Robert H. Yager.

The editors are grateful to the President, Chancellor, Comptroller, and staff of the Medical College of Virginia for their continuing cooperation in the work of the Editorial Office at the Medical College under contract with the Office of the Surgeon General. Acknowledgment is made to Miss Margaret McCluer, Librarian of the Tomkins-McCaw Library of the Medical College, and her staff for their material help and friendly interest in the project.

The authors and editors have again relied greatly upon the services of the Medical Statistics Division of the Office of the Surgeon General. Mr. E. L. Hamilton, Chief, Mr. A. J. McDowell, Assistant Chief, and Mr. M. C. Rossoff, Assistant Chief, Statistical Analysis Branch, have not only provided essential data but have also checked and reviewed all statistical information in this volume. Their contribution has been a substantial one. The Scientific Illustration Division, Medical Illustration Service, Armed Forces Institute of Pathology, under the direction of Mr. Herman Van Cott, prepared the illustrations for this volume.

Cordial thanks are extended by the editor of the preventive medicine series to Col. John Boyd Coates, Jr., MC, who has energetically expedited the publication of these volumes and has striven successfully to produce books of high quality in content as well as in appearance. Grateful appreciation is likewise expressed for the professional skill and experience which has been brought to the production of the volume by Mrs. Willa B. Dial, formerly Chief of the Editorial Branch of The Historical Unit, in the arduous task of final preparation and publication.

The editors gratefully acknowledge the assistance of Miss C. Louise Brady, publications editor of the Editorial Branch, The Historical Unit, who performed the final publications editing and prepared the index for this volume.

EBBE CURTIS HOFF, Ph. D., M.D.

Contents

Illustrations

Tables

Appendix Tables

Charts

Maps

CHAPTER I

Actinomycosis

David T. Smith, M.D.

Actinomycosis was of minor importance in World War II. The annual admission rate per 1,000 average strength was about 0.01 and remained remarkably constant in the continental United States and in the various theaters of operations overseas. There were no epidemics or seasonal variations in the incidence of the disease. Sample tabulations of individual medical records for the years 1942–45 indicate that in the total U.S. Army there were about 230 cases of actinomycosis as compared to the approximately 200 cases of tularemia, the estimated 1,150 cases of trachoma, and the 1,200 cases of undulant fever (brucellosis). There were four deaths due to actinomycosis, all occurring among troops in the United States.

The rate of occurrence of actinomycosis in military personnel was certainly not higher, and was probably lower, than that in the civilian population during the same period of years. The only available data for the occurrence of this disease in the civilian population come from Duke Hospital, Durham, N.C., where 71 cases were found in 250,000 admissions.[1]

Organisms belonging to two different genera are responsible for the clinical syndrome known as actinomycosis. Most cases are caused by the anaerobic organism known as *Actinomyces bovis*, but some are produced by members of the aerobic genus *Nocardia*, especially the acid-fast *Nocardia asteroides*. The source of *A. bovis* is the patient's own mouth, and soldiers with clean teeth and healthy gums would harbor the organism in a smaller percentage than would civilians who as a group practice poorer oral hygiene. The source of *N. asteroides* is the soil, and exposure would be less general among properly clothed and booted soldiers than among civilians. None of these organisms spread directly from patient to patient (fig. 1). Therefore, the crowding in Army camps and in field maneuvers would have no effect in increasing the rate of infection.

Although no statistics have been published concerning the case fatality rates for actinomycosis before the introduction of sulfonamides and antibiotics, the mortality in cervicofacial actinomycosis is estimated by the writer to have been about 25 percent, that in pulmonary actinomycosis 50 percent, and that in abdominal actinomycosis 99 percent. Only 4 deaths among approximately

---

[1] Smith, D. T.: Fungous Infections in the United States. J.A.M.A. 141: 1223–1226, December 1949.

230 cases, or a case fatality rate of about 1.7 percent, represents a remarkable triumph for military medicine. Sulfadiazine, penicillin, iodides, and surgical procedures were used in various combinations in individual cases. Early cases of cervicofacial actinomycosis usually respond to medical therapy with sulfonamides, penicillin, or both, without the necessity for surgery. Pulmonary actinomycosis usually requires chest-wall excisions or lobectomy, as well as antibiotic and iodide therapy. Abdominal actinomycosis usually requires a series of operations and prolonged treatment with antibiotics and iodides.

Actinomycosis caused by the aerobic *N. asteroides* does not respond to penicillin and other antibiotics but may be cured with sulfadiazine or other sulfonamides.

FIGURE 1.—Actinomycosis, jaw, observed at Letterman General Hospital, San Francisco, Calif., in a sergeant who had punctured the floor of his mouth with a weed stem while picking his teeth.

CHAPTER II

Epidemic Keratoconjunctivitis

Murray Sanders, M.D.

HISTORICAL NOTE

When a clinical entity makes its appearance de novo, it becomes a subject of interest to the entire medical profession. When such a phenomenon occurs precipitously in the industrial heart of a newly organized war effort, spreading its unpleasant and incapacitating effects with great speed, then it can assume proportions of a national problem affecting all military and civil departments. This, for a time, was the history of epidemic keratoconjunctivitis. It was these wartime potentialities which led the Preventive Medicine Service, Office of the Surgeon General, to initiate investigation of this disease.

As far as can be determined by medical record, epidemic keratoconjunctivitis first made its appearance in the continental United States sometime during the summer of 1941. The epidemic nature of the disease had been recognized in 1889 by Ernst Fuchs, who described a superficial keratitis somewhat similar to herpes simplex infections of the eye but not associated with the formation of vesicles.[1] He emphasized the consistent appearance of symptoms of an acute conjunctivitis with subsequent spread to the cornea, frequent appearance in only one eye, and persistence of pain, photophobia, and lacrimation. Other authors have reported similar outbreaks from 1900 to 1930 in Bombay and Madras. These outbreaks were considerably more extensive than the one reported by Fuchs but appeared to be clinically related to it. An outbreak in London in 1933 was minor, but there were subsequent extensive epidemics in India in 1933 and 1934, in China in 1936, in Germany from 1938 to 1940, in Malaya from 1935 to 1938, and in Tasmania in 1941.

By 1941, the disease had appeared in epidemic proportions in Oahu, Hawaii, and consequently became of increasing interest to the United States. In the summer of 1941, 10,000 cases occurred in Oahu,[2] and in the late summer and early fall of the same year the disease made its first appearance in continental United States, when 16 cases were reported in a veterans' hospital in San Fernando, Calif. The disease then spread with devastating rapidity up and down the coast, appearing especially in industrial areas. Only those who have witnessed its explosive onslaught in a crowded factory can appreciate the enormity of the psychological effect on the industrial population.

---

[1] Fuchs, Ernst: Lehrbuch der Augenheilkunde. Leipzig und Wien: Franz Deuticke, 1889.
[2] Holmes, W. J.: Epidemic Infections Conjunctivitis. Hawaii M.J. 1: 11–12, November, 1941.

The apparently inexplicable spread of the disease through all departments of a factory and the inability of medical departments to cope with the epidemic quickly reduced the efficiency of industrial centers.

The situation became considerably aggravated when, in the early months of 1942, epidemic keratoconjunctivitis made its appearance on the east coast. Here, the acute symptoms became more severe and were followed by complications which lasted longer and which occurred in a much greater percentage of cases than on the west coast. By the fall of 1942, when approximately 4,000 cases developed in one of the most important defense factories, the situation became critical. It was at this time that the Office of the Surgeon General began a concerted, disciplined attack on the problem based on studies which had been initiated with considerable foresight by the Preventive Medicine Division in March 1942 at the College of Physicians and Surgeons, Columbia University, New York. The disease practically disappeared within 3 months after the isolation of the etiological agent. After January 1943, it was no longer a source of concern, and incidence was of such a low order in the few instances where epidemic keratoconjunctivitis still persisted that the threat was considered nullified.[3]

CLINICAL DESCRIPTION

There is no doubt that epidemic keratoconjunctivitis is a distinct clinical entity. However, until fully developed cases appear in epidemic numbers, the wide variability of introductory signs and symptoms may lead to confusion with other acute conjunctivitides. Perhaps the one factor that may be considered a valuable warning in a preepidemic period is the persistence of an acute conjunctivitis for more than 10 days with little or no secretion present but with considerable lacrimation and soreness in the preauricular or submandibular areas. Such systemic signs as headaches, rhinitis, or malaise should add to, rather than detract from, the suspicion of this disease.

The clinical appearance of epidemic keratoconjunctivitis to an examining physician is that of an acute conjunctivitis, frequently follicular in type. Hyperemia and edema (especially of the upper lid) are predominant signs. It has been said that the follicular hypertrophy is due to a local proliferation of lymphoid cells within the stroma of the conjunctiva.[4] As a result of the proliferation, small areas of glistening, raised mucous membrane can be seen. In this early stage, the patient complains frequently of a foreign-body sensation, and, although lacrimation is marked, secretions are minimal. Often, symptoms may appear before marked physical changes occur. On the other hand, fully developed follicles may be disguised by the edema of the surrounding tissue, with the lymphoid hyperplasia appearing diffusely in the

---

[3] Between 1943 and 1951, epidemic keratoconjunctivitis appeared sporadically in different parts of the Nation, but, in each instance, the successful application of the lessons learned during the epidemic months resulted in limitation of the number of cases and averted a major epidemic.

[4] Sanders, M.: Epidemic Keratoconjunctivitis. Scient. Monthly 57: 469–472, November 1943.

deeper connective tissue. Where the latter picture is seen, there may be noted a massive pouching out of the palpebral mucous membrane which becomes dramatically apparent when the lower lid is pulled down. Involvement of the bulbar conjunctiva is usual, and the chemosis may be sufficiently severe to produce a projection of the bulbar mucous membrane between the lids that is visible when the patient's lids are at rest. When fully developed, an acute case of epidemic keratoconjunctivitis can present a fearsome picture.

Lymphadenopathy of varying degree almost inevitably accompanies acute signs and symptoms. The glands which are usually involved are the preauricular, cervical, and submental. One, two, or all three groups of glands may be involved, and the tenderness may be so extreme that chewing becomes painful. Referred pain along the mandible is not unusual. Lymphadenopathy may be present for only a few days or may persist for weeks after subsidence of other acute signs. Laboratory tests made during this stage of the disease are not particularly diagnostic. Conjunctival scrapings may show occasional lymphocytes or large mononuclears. If a secondary invader is present, a polymorphonuclear reaction may be apparent. Bacteriologic studies of secretions are negative or result in the demonstration of what are apparently secondary invaders.

Although unilateral involvement is the rule, the disease may involve both eyes. If both eyes are involved, however, it is usual for the second eye to show a milder infection. The intensity of clinical signs and the severity of the disease vary greatly from patient to patient within the same epidemic or within the same household, and it is impossible to prognosticate the outcome or the expected duration of the acute disease on the basis of early clinical appearance.

The association of systemic signs and symptoms with the acute ocular symptoms should be mentioned. In several hundred cases, headaches were associated with the ocular disease, and, in one study,[5] it was noted that the headaches started within 36 hours after the onset of the conjunctivitis, were fronto-occipital in distribution, and could not be relieved by analgesics. In the same outbreak, rhinitis and pharyngitis were frequently seen in the early stages of the disease. In two cases seen in Schenectady, N.Y.,[6] there was possible nervous-system involvement marked by a persistent and extreme somnolence. One of the patients was drowsy and exhibited emotional disturbance in association with the onset of the eye disease. There were additional systemic signs of malaise and fever, sometimes in conjunction with considerable nasal discharge which was usually serious in character.

It will be recalled that the first epidemic began on the west coast of the United States and then spread to the Atlantic coast. It is of interest, there-

[5] Sanders, M., Gulliver, F. D., Forchheimer, L. L., and Alexander, R. C.: Epidemic Keratoconjunctivitis; Clinical and Experimental Study of an Outbreak in New York City: Further Observations on the Specific Relationship Between a Virus and the Disease. J.A.M.A. 121: 250–255, 23 Jan. 1943.

[6] Symposium on Epidemic Keratoconjunctivitis, 4 Dec. 1942, held at the College of Physicians and Surgeons, Columbia University, New York.

fore, to compare the two outbreaks since there is a suggestion that the eastern form, while apparently due to the same infectious agent, was more virulent than that encountered on the Pacific coast. On the west coast, the patients were usually incapacitated for 1 or 2 weeks, and corneal opacities of a transient character appeared in 40 percent to 75 percent of the cases. On the east coast, on the other hand, subjective symptoms were considerably more distressing in the majority of cases, and the acute stage lasted frequently for 2 or 3 weeks or longer. Furthermore, corneal opacities were observed in as many as 85 percent of the cases and persisted for many months.

As the name of the disease suggests, the cornea usually becomes involved as the acute phase of the disease passes, or within 7 to 10 days after the appearance of the first signs. The inception of this stage of the disease may be marked by a sudden ocular pain, by photophobia, or by both. However, in a fairly large number of cases, the infiltrates appear subtly, and the patient may notice only gradual blurring of the vision or a foggy halo around lights. The characteristic pathologic picture of the opacities is one of multiple subepithelial infiltrates tending to be localized in the pupillary area and appearing from one to several weeks after the onset of the acute conjunctivitis. It is interesting to note that patients with severe conjunctival involvement may go on to spontaneous recovery in approximately 10 days without development of corneal opacities. On the other hand, in some cases of mild conjunctivitis, the acute stage may persist for weeks and may ultimately resolve with the formation of many opacities and impairment of vision. As a rule, ulceration of the cornea does not occur in true, uncomplicated epidemic keratoconjunctivitis.

INVESTIGATION OF THE ETIOLOGY

Before 1942, the disease entity known as epidemic keratoconjunctivitis spread without hindrance, and the only medical reports were clinical records in industrial centers, particularly west coast shipyards, describing the incapacitating effect of the disease on thousands of essential workers. However, in March 1942, at the College of Physicians and Surgeons, a virus was isolated from the eyes of two patients suffering from the disease. It was not surprising that a transmissible agent could be isolated from these patients since the disease was obviously of infectious origin. Furthermore, the scrapings from the conjunctival surfaces of patients with acute cases, which usually revealed lymphocytes in association with monocytes, were consistently free of significant bacteria and pointed to a probable viral causation.

The initial isolations of the virus were accomplished not by direct animal inoculation but by incidental passage to tissue cultures into which conjunctival scrapings from the patients were placed.[7] After incubation in the tissue

---

[7] (1) Sanders, M.: Epidemic Keratoconjunctivitis ("Shipyard Conjunctivitis"). I. Isolation of a Virus. Arch. Ophth. 28: 581–586, October 1942. (2) Sanders, M., and Alexander, R. C.: Epidemic Keratoconjunctivitis: I. Isolation and Identification of a Filterable Virus. J. Exper. Med 77: 71–96, January 1943. (3) See footnote 5, p. 5.

cultures, it was possible to transmit a fatal disease to Swiss white mice by intracerebral injection.[8] Further investigation with unweaned Swiss white mice proved the virus pathogenic by intranasal, intraperitoneal, and intracerebral routes. For adult mice, however, only the intranasal and intracerebral routes could be used for transmission of the agent, and in the case of rabbits only the intracerebral route was effective. Once the agent was isolated so that it could be transmitted from mouse to mouse, a characteristic picture of a mouse meningoencephalomyelitis was observed. While this was not typical of any specific pathologic entity, it indicated neurotropic attack, which was substantiated by the fact that only brain tissues were consistently pathogenic for mice.

It is notable that, in the six strains isolated at the College of Physicians and Surgeons, a transmissible agent could be obtained only by inoculation of conjunctival scrapings into mouse brain-tissue cultures. In the case of serial tissue culture, a transmissible agent could be maintained only after 6 days of incubation at room temperature and when the culture-to-culture inoculum consisted of ground-up cells as well as fluid medium.

The specific nature of the experimentally isolated agent was suggested by the high degree of consistency with which serum from convalescent patients neutralized the virus. Through the use of the neutralization techniques, it was noted that the eastern and western outbreaks appeared to be due to the same agent, since the New York virus was neutralized by convalescent serums from both areas. As a matter of fact, as the disease spread over the country, convalescent serums obtained from all areas neutralized the New York virus.

Two other observations are of interest in relation to the specific nature of the virus. In filtration experiments, the virus passed without difficulty through an E.K. Seitz filter (double pads) and through all grades of Berkefeld filters. In more quantitative filtration analyses, the agent passed consistently through graded collodion membranes with an a.p.d. (average pore diameter) of from 75 to 100 millimicrons and to a lesser extent through membranes with an a.p.d. of from 50 to 75 millimicrons. When the a.p.d. of collodion surfaces was less than 50 millimicrons, the virus was retained.

The second observation of interest is that the inoculation of the experimentally isolated agent onto the conjunctival surfaces of a human volunteer reproduced a mild but characteristic picture of epidemic keratoconjunctivitis. Furthermore, the serum of the human volunteer, while not neutralizing the mouse virus before infection, contained neutralizing antibodies for it 1 month after infection.

---

[8] Since the original work was carried out in the isolation of a mouse virus from patients suffering from epidemic keratoconjunctivitis, there has been great difficulty in isolating similar strains. There is a possibility that identical or similar mouse viruses were isolated, but statements to this effect are based on personal correspondence. According to the Review of Medical Microbiology, Second Edition, 1956, one strain of APC virus type 8 has been associated with outbreaks of the disease.

Although four additional isolations were made at Columbia and confirmation was reported by Braley,[9] the question has been raised whether the virus isolated in New York is a new one or is a variant of herpes simplex. Evidence for the latter view has been recorded by the group at the Wilmer Ophthalmological Institute and the Department of Medicine, the Johns Hopkins Hospital and University, Baltimore, Md.,[10] who believed that the agent isolated at that institution was related to herpes simplex. Their conclusions were based on partial cross-neutralizations between herpes simplex and epidemic keratoconjunctivitis viruses.

The evidence for specific neutralization of the virus isolated in New York is strong. No neutralizing antibodies were demonstrated in so-called normal populations. In a study carried out with the cooperation of the New York State Health Department, 118 serums from one of the worst outbreaks were studied by number at Columbia University. In this group of serums were included those of normal individuals, those of epidemic keratoconjunctivitis patients in the acute and in the convalescent phase of the disease, and those of contacts of such patients. The laboratory tests were carried out by number and entirely without knowledge of the history of the individual serum. Following the laboratory procedure, correlations were made between the presence or absence of neutralizing antibodies and the history of the patient. The final results are presented in table 1.

TABLE 1.—*Extent of neutralization to the virus of epidemic keratoconjunctivitis shown by selected serums*

Titer of serum	Number of neutralizing doses	Cases			Contacts		Controls	Total
		Early (1st week)	Convalescent (6–10 weeks)	Late (4–5 months)	Intimate (5 months after onset of case)	Remote		
10^{-6}	0	30		4	7	4	28	73
10^{-5}	10	1		2	4	4	1	12
10^{-4}	100			2	3			5
10^{-3}	1, 000		14	2	3			19
10^{-2}	10, 000		7					7
10^{-1}	100, 000		2					2
Total		31	23	10	17	8	29	118

Source: Korns, R. F., Sanders, M., and Alexander, R. C.: Epidemic Keratoconjunctivitis: Correlation of Epidemiologic Data and Results of Serum Virus Neutralization Tests. Am. J. Pub. Health 34: 567–571, June 1944.

---

9 Braley, A. E.: Epidemic Keratoconjunctivitis. Tr. Am. Acad. Ophth. 48: 153–174, January–February 1944.

10 Maumenee, A. E., Hayes, G. S., and Hartman, T. L.: Isolation and Identification of the Causative Agent in Epidemic Keratoconjunctivitis (Superficial Punctate Keratitis) and Herpetic Keratoconjunctivitis. Am. J. Ophth. 28: 823–839, August 1945.

Neutralization results from the use of the New York virus against acute and convalescent serums from both east and west coasts suggest an immunologic relationship between the virus isolated in laboratory animals and the disease known as epidemic keratoconjunctivitis.

In addition, the filtration activity of the New York virus should be emphasized. It will be noted that the epidemic keratoconjunctivitis virus can pass without difficulty through a double Seitz filter. This has never been recorded for the recognized strains of herpes simplex virus. Furthermore, it will be remembered that, in the quantitative graded collodion-membrane tests, the epidemic keratoconjunctivitis virus passed through membranes with very low a.p.d. values. On the basis of Elford's calculations, this virus can be considered as being in the group of small viruses, such as that of the encephalitides.

While the result of the human volunteer inoculation should not be considered conclusive, nevertheless it is noteworthy that the volunteer in question had herpes simplex neutralizing antibodies prior to infection with the epidemic keratoconjunctivitis virus and had no neutralizing antibodies to the latter virus before infection. It was only during the convalescent phase of his illness that antibodies to the last-named virus appeared in his blood.

The possibility that the Johns Hopkins group dealt with either an incidental herpes virus or mixed viruses, that is, herpes mixed with epidemic keratoconjunctivitis, cannot be disregarded. It is of interest that their observations included positive fluorescent staining opacities, revealing a rupture of the conjunctival epithelium, characteristic of herpetic ulceration. In contrast, in the New York studies, all opacities were noted to be subepithelial in character, and no fluorescent staining was ever demonstrated.

Actually, the possibility of a relationship between the virus of epidemic keratoconjunctivitis and herpes simplex has become very remote, in view of recent work by Cheever[11] and Ruchman.[12] Both investigators demonstrated conclusively that the virus of epidemic keratoconjunctivitis is closely related immunologically to St. Louis encephalitis. In fact, epidemic keratoconjunctivitis could not be differentiated from St. Louis encephalitis by intracerebral neutralization tests. Cheever and Ruchman also found a similar, but more distant, relationship between epidemic keratoconjunctivitis and Japanese and West Nile encephalitic viruses. It was noted, however, that the virus of epidemic keratoconjunctivitis had an increased pathogenicity for rabbits in contrast to the classical St. Louis encephalitis virus. These findings are consistent with the report by Heyl, Allen, and Cheever[13] who also found no

---

[11] Cheever, F. S.: Studies on Possible Relationship Between Viruses of St. Louis Encephalitis and Epidemic Keratoconjunctivitis. Proc. Soc. Exper. Biol. & Med. 77: 125–129, May 1951.

[12] Ruchman, I.: Immunological Relationship Between Epidemic Keratoconjunctivitis and St. Louis Encephalitis Viruses. Proc. Soc. Exper. Biol. & Med. 77: 120–125, May 1951.

[13] Heyl, J. T., Allen, H. F., and Cheever, F. S.: Quantitative Assay of Neutralizing Antibody Content of Pools of Gamma Globulin From Different Sections of the United States Against the Viruses of Herpes Simplex, Lymphocytic Choriomeningitis and Epidemic Keratoconjunctivitis. J. Immunol. 60: 37–45, September 1948.

559625°—61——3

antigenic relationship between the viruses of herpes simplex and epidemic keratoconjunctivitis when they correlated neutralizing antibodies in pools of gamma globulin from different sections of the United States. When tested against herpes simplex, neutralizing antibodies were found, whereas none could be demonstrated against the epidemic keratoconjunctivitis virus. The observations by Cheever and Ruchman tend to clarify studies carried out by Sanders on the specific relationship between the New York disease and the clinical entity of epidemic keratoconjunctivitis (particularly with reference to possible encephalitic involvement in some patients, as noted in the clinical description of the disease), as well as the filterable activity of the New York agent. The relationship between the epidemic keratoconjunctivitis and St. Louis encephalitis has, of course, raised an interesting question on the adaptation of human viruses to ocular tissue. This subject is comprehensively discussed in an editorial in the 7 July 1951 issue of the *Journal of the American Medical Association*, in which attention is brought to the biphasic activity of the epidemic keratoconjunctivitis and St. Louis encephalitis viruses.

EPIDEMIOLOGY

It is an interesting commentary on the limitations in the practice of medicine that many months had elapsed after the first cases of epidemic keratoconjunctivitis had been noted in the United States and thousands of patients had been infected before the epidemiologic significance of contact infections was appreciated. It was only after the disease had increased in virulence and had spread to the east coast that the efforts of workers in the New York State Department of Health revealed the uncomplicated picture of transmission of the disease. The first significant evidence was found in an occupational analysis of one of the most heavily involved factory areas. As can be seen from table 2, which reports incidence of epidemic keratoconjunctivitis among employees in a plant in Schenectady, N.Y., in 1942, the 31.3 percent incidence among physicians and nurses was outstanding, since the second most heavily infected group (welders, cutters, solderers, and babbitters) showed an incidence of only 6.5 percent or 6.3 percent.[14] Considerable additional evidence soon made its appearance in the form of individual case histories, as reported by Braley, as well as in further epidemiologic studies, reported by Sanders and coworkers. The conclusion was inevitably reached that any assembly point for patients with traumatized or infected eyes served as an efficient focus for dissemination of the disease as long as an occasional person infected with epidemic keratoconjunctivitis was present. In view of the important role which contact infections played in the spread of epidemic keratoconjunctivitis, it was not surprising that the virus could be demonstrated in solutions commonly used for treatment of ocular infections. It thus became of paramount importance to institute and

---

[14] Perkins, J. E., Korns, R. F., and Westphal, R. S.: Epidemiology of Epidemic Keratoconjunctivitis. Am. J. Pub. Health 33: 1187–1198, October 1943.

maintain strict, albeit simple, hygienic procedures and aseptic techniques in factory clinic and in private medical practice. The program for dissemination of information set up by the Preventive Medicine Division, Office of the Surgeon General, was admirably suited for this purpose.

TABLE 2.—*Incidence of epidemic keratoconjunctivitis, by occupational group*

Occupational group	Attack rate	Occupational group	Attack rate
	Percent		*Percent*
Physicians, nurses	31. 3	Stockroom keepers	1. 7
Welders, cutters	6. 5	Truckdrivers	1. 7
Solderers, babbitters	6. 3	Supervisors	1. 5
Crane followers	5. 5	Receivers, shippers	1. 2
Chippers, filers, grinders	3. 9	Assemblers	1. 2
Sheet-metal workers	3. 4	Laborers, porters	1. 1
Painters, varnishers	3. 3	Winders	1. 0
Policemen	3. 1	Platers, dippers, polishers	. 7
Maintenance and repair workers	2. 9	Miscellaneous workers	. 7
Machine and press operators	2. 0	Engineers	. 6
Testers	1. 9	Clerks	. 4
Toolmakers and diemakers	1. 8	Draftsmen	. 1

TREATMENT

It is axiomatic that, in those fortunate instances in which medicine has specific therapy available to combat infection, prescriptions are few and brief. The wide variety of the prescriptions used in the attempt to arrest the progress of epidemic keratoconjunctivitis in 1942 and 1943 is evidence of the paucity of our knowledge of therapy with respect to this disease. The whole gamut of symptomatic treatments and chemical agents was used, from hot and cold compresses to all forms of sulfonamides. Little or no success attended these efforts, and the disease ran a self-limited course with the incidence of the complication of corneal opacities running as high as a discouraging 85.5 percent in the Schenectady outbreak.

Possibly, the first therapeutic success was noted in 1943,[15] following the use of convalescent serum of high titer. But even in this instance, the series of cases was admittedly small, and only the prompt application of plasma or serum before the fifth day of the disease appeared useful. In a final evaluation of this convalescent serum therapy, Braley chose the incidence of opacities as a criterion for therapeutic success or failure. He stated that opacities occurred in 99 percent of his patients treated symptomatically. In contrast, he found an incidence of opacities of 30 percent in those epidemic keratoconjunctivitis patients treated with convalescent plasma.

---

[15] (1) Braley, A. E., and Sanders, M.: Treatment of Epidemic Keratoconjunctivitis; Preliminary Report of Ten Cases. J.A.M.A. 121: 999–1000, 27 Mar. 1943. (2) See footnote 8, p. 7.

Since the advent of the newer antibiotics, there is some reason to hope for discovery of an effective therapeutic agent. In studies in New York and Miami, the possibility of Aureomycin as such an agent was raised.[16] But again, the number of patients treated was small and evidence suggested that only administration of large amounts of the antibiotic intravenously in conjunction with its local application is effective during the first week of the disease.

In the evaluation of the therapy of epidemic keratoconjunctivitis, it cannot be stated too strongly that prevention of the disease is at present much simpler than its cure. Prompt initiation of hygienic or aseptic procedures when the first cases of the disease are recognized can save many hours of essentially unrewarding treatment.

EPIDEMIC KERATOCONJUNCTIVITIS AS A MILITARY PROBLEM

Few other diseases studied during World War II can be evaluated in relation to the military effort as clearly as epidemic keratoconjunctivitis. Apparently nonexistent in the United States as a clinical entity before the war effort was launched, this disease emphasized the importance of industrial effort in modern warfare by incapacitating numerous skilled, essential workers. The rapidity with which the Preventive Medicine Division, Office of the Surgeon General, nullified the threat to industry was dramatic, and it is of decidedly more than historical interest to note the action taken as well as the results obtained. Control of the disease was undertaken by means of the mobilization of trained personnel and by the rapid dissemination of technical information to physicians, particularly those having industrial responsibilities.

In March 1942, studies concerned with the then unknown etiology of epidemic keratoconjunctivitis were initiated through the Commission on Neurotropic Virus Diseases of the Board for the Investigation and Control of Influenza and Other Epidemic Diseases in the Army, at the College of Physicians and Surgeons, Columbia University. The project was placed in the hands of Dr. Murray Sanders of the Department of Bacteriology, who discovered that the causative agent was a virus. Dr. Sanders was later appointed consultant to the Secretary of War and a member of the Commission on Neurotropic Virus Diseases. Thus, the Office of the Surgeon General was constantly in touch with the investigative program.

When the nature of the disease was appreciated, highly effective epidemiologic studies were made possible because of the centralization of authority through the Office of the Surgeon General. Thus, when epidemics occurred in industrial plants engaged in warwork at Hartford and Schenectady, it was possible to authorize Dr. Sanders to work with health authorities in both areas, who cooperated to obtain data permitting an effective check on new

---

[16] (1) Braley, A. E., and Sanders, M.: Aureomycin in Ocular Infections; A Preliminary Report. J.A.M.A. 138: 426–427, 9 Oct. 1948. (2) Braley, A. E., and Sanders, M.: Aureomycin in Ocular Infections; A Study of Its Spectrum. Ann. New York Acad. Sc. 51: 280–289, 30 Nov. 1948.

cases. There is little doubt that the teamwork among physicians, research investigators, epidemiologists, and other skilled investigators accelerated a solution to many aspects of the problem.

The Preventive Medicine Division was in a position to disseminate the new information at hand to civilian physicians (through the Industrial Medicine Section) and to medical officers in the various branches of the Armed Forces. This phase of the work was carried out in the following manner: [17]

1. On 21 November 1942, letters concerning the potential danger of epidemic keratoconjunctivitis were sent from the Office of the Surgeon General to the Chief of Ordnance, the Air Surgeon, the Surgeon General of the Navy, and others, calling attention to the disease and stating: "It is felt that it is highly important that medical officers and medical directors at arsenals, depots, and munition works become fully acquainted with this entire subject."

2. On 4 December 1942, a symposium on epidemic keratoconjunctivitis was held at the College of Physicians and Surgeons under the auspices of the Preventive Medicine Division. Arrangements for this symposium were made primarily by Col. Anthony J. Lanza, MC, Chief, Occupational Hygiene Branch, Preventive Medicine Division, who wished to bring the disease to the attention of medical officers and physicians in industrial plants. Col. (later Brig. Gen.) James S. Simmons, MC, Director, Preventive Medicine Division, Office of the Surgeon General, made the opening remarks at the meeting. The symposium was well attended and had immediate effect in arousing several State and industrial medical organizations to a recognition of the importance of the disease.

3. During November and December 1942, a circular letter on epidemic keratoconjunctivitis was drafted and submitted to numerous authorities for criticism and revision. This resulted in the distribution of Circular Letter No. 14, Office of the Surgeon General, dated 11 January 1943, to all medical officers.

4. The Preventive Medicine Division not only accumulated and distributed widely all publications and proceedings of meetings but also arranged for further meetings similar to the New York symposium in Chicago, St. Louis, and various other centers potentially important to the war industrial effort.

The quick removal of epidemic keratoconjunctivitis from the list of important problems in civilian life attests to the effectiveness of the program of The Surgeon General. Furthermore, the approximate total of 1,000 cases in the Armed Forces, with rapid control in the affected units, was considered a highly satisfactory minimum against the potential damage that could have occurred in such crucial elements as air or mechanized groups.

---

[17] Letter, Col. J. S. Simmons, MC, Director, Preventive Medicine Division, Office of the Surgeon General, to Dr. W. C. Davison, National Research Council, 12 Jan. 1943.

CHAPTER III

Hookworm

Clyde Swartzwelder, Ph. D.

HISTORICAL NOTE

During World War I, there was no indication of acquisition of hookworm infection in oversea troops.[1] This conclusion was based upon a survey of 1,200 oversea and 300 home service troops in the U.S. Army. The oversea troops included men who had seen service mainly in France, with the exception of a few who had served on the Mexican border. Before World War II, oversea campaigns in the tropics were confined mainly to small-scale operations in Central America, Cuba, the Philippines, and Puerto Rico. Specific information concerning the military significance of hookworm infections in these campaigns appears to be lacking. Castellani [2] reported that hookworm infection did not constitute a problem in Italian troops during the Italo-Ethiopian War.

The two species of hookworm which produce intestinal infection in men are *Necator americanus* and *Ancylostoma duodenale.* The American hookworm, *N. americanus*, occurs in the Southern United States, the Caribbean Islands, Central America, the northern part of South America, central and south Africa, southern Asia, Melanesia, and Polynesia. It is not endemic in Europe. The Old World hookworm, *A. duodenale*, has a geographic distribution which includes southern Europe, the north coast of Africa, northern India, northern China, and Japan. *A. duodenale* is not endemic in the United States. An assessment of the medicomilitary significance of hookworm infection during World War II, when U.S. Army troops were stationed in many of the aforementioned oversea areas, must be based upon the number of infections acquired, their clinical significance, and the possibility of troops' having implanted species of hookworm in areas where these species had not previously been endemic.

---

1 (1) Kofoid, C. A., Kornhauser, S. I., and Plate, J. T.: Intestinal Parasites in Overseas and Home Service Troops of the U.S. Army, With Especial Reference to Carriers of Amebiasis. J.A.M.A. 72: 1721–1724, June 1919. (2) The Medical Department of the United States Army in the World War. Washington: U.S. Government Printing Office, 1928, vol. IX, pp. 529–549.

2 Castellani, A.: Medical Aspects of the Italo-Ethiopian War, October 3, 1935–May 9, 1936. Mil. Surgeon 81: 1–16, July 1937.

INCIDENCE OF HOOKWORM INFECTION IN WORLD WAR II

During World War II, large-scale military operations were conducted by U.S. Army troops for the first time in such tropical areas as Africa, India, China, and the South Pacific, where hookworm infection is heavily endemic. Large numbers of troops were exposed to this infection as they slept in foxholes, crawled through the jungle, occupied native villages, or otherwise came into intimate contact with soil previously contaminated by the excreta of infected inhabitants. The geographic areas in which the troops were deployed and the nature of combat during World War II resulted in exposure of many soldiers to hookworm infection.

Preliminary data indicated that during the years 1942 through 1945 there were 22,238 admissions to hospital and quarters for the treatment of hookworm infection (table 3). The number of admissions for hookworm infection increased from 2,526 in 1942 to 11,060 in 1945. This increase is probably explained by the expansion of the services and by the presence of a larger number of troops in tropical areas during the latter part of the war. The major increase in the number of admissions for hookworm infection was in the oversea forces. The number of admissions in the continental United States remained relatively constant except for the year 1944 in which admissions for these infections were fewer than in the preceding and following years. Since many troops were native residents of the Southern United States, where *N. americanus* is endemic, some of the hookworm infections undoubtedly were acquired before entrance into military service. Also, some infections acquired by individuals overseas probably were diagnosed on their return to the United States. The admission rates shown in table 3 support the view that the majority of hookworm infections were acquired in oversea areas. The rate for continental United States troops for the period from 1942 through 1945 was 0.53. In contrast, the rate for forces in oversea theaters was 1.35.

Data on admissions in oversea areas for 1944 (table 3) indicate that the Central and South Pacific and the Southwest Pacific areas, Latin America, and the Mediterranean and China-Burma-India theaters reported the largest numbers of cases, respectively. Areas with the highest admission rates per 1,000–man strength were Latin America, the Central and South Pacific, the Southwest Pacific, and the China-Burma-India theater, respectively. No deaths attributable to hookworm were reported in U.S. Army troops.

The total number of admissions for hookworm infection, 22,238, and the admission rate of 0.87 per 1,000 average strength for all Army troops (table 3) indicate a relatively low incidence of infection. This interpretation seems justifiable in view of the large number of troops sent to the tropics and the nature of their military activities which frequently resulted in unavoidable exposure. This appraisal seems more tenable when it is realized that these figures include some hookworm infections in persons who resided in the Southern United States before military service and in troops from Latin America.

TABLE 3.—*Admissions for hookworm infection in the U.S. Army, by theater or area and year, 1942–45*

[Preliminary data based on sample tabulations of individual medical records]

[Rate expressed as number per annum per 1,000 average strength]

Theater or area	1942–45		1942		1943		1944		1945	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Continental United States	7,783	0.53	2,201	0.83	2,258	0.44	1,249	0.31	2,075	0.71
Overseas:										
Europe	382	.09	1	.01	41	.15	130	.08	210	.09
Mediterranean [1]	264	.18			50	.11	179	.28	35	.10
Middle East	27	.18	1	.17	8	.15	13	.28	5	.12
China-Burma-India	737	1.68			44	1.11	178	1.06	515	2.33
Southwest Pacific	8,207	4.47	15	.21	1,031	5.43	1,161	2.15	6,000	5.79
Central and South Pacific	3,201	2.55	58	.38	266	.91	1,217	2.77	1,660	4.42
North America [2]	138	.28	8	.08	24	.12	96	.74	10	.15
Latin America	1,469	3.85	242	2.37	341	2.82	361	4.21	525	7.21
Total overseas [3]	14,455	1.35	325	.55	1,806	1.07	3,339	.87	8,985	1.93
Total Army	22,238	.87	2,526	.78	4,064	.59	4,588	.59	11,060	1.46

[1] Includes North Africa.
[2] Includes Alaska and Iceland.
[3] Includes admissions on transports.

Surveys of Troops for Hookworm Infection

There is much evidence that there was an active interest in the prevention of hookworm infection in troops, in the assessment of its military significance during the war, and in the minimization of the possibility of implanting *A. duodenale* in the United States where this species was not endemic. Numerous surveys were conducted among oversea and repatriated troops and among natives who represented reservoirs of infection and who were living near troop concentrations. A few of these are cited to indicate the nature of the hookworm problem. Apparently, all surveys of troops for hookworm infection utilized a flotation technique for detection of the organism. Usually, the zinc sulfate flotation method was employed.

Most and others [3] reported an 11.5-percent prevalence of hookworm infection in 2,500 patients at Moore General Hospital, a tropical disease hospital at Swannanoa, N.C., among men who had returned from service in various Pacific islands. In contrast, prevalence of 6.2 percent was found in 4,300 men who had seen service only in the United States. Sixty-five percent of 169 infections, in which the species of hookworm was determined after treatment, were due to *A. duodenale.* The higher incidence of infection in troops with oversea service was believed to be largely due to *A. duodenale.* Hookworm

[3] Most, H., Hayman, J. M., Jr., and Wilson, T. B.: Hookworm Infections in Troops Returning From the Pacific. Am. J.M. Sc. 212: 347–350, September 1946.

559625°—61——4

infections in 100 malarial and surgical cases studied were subclinical in nature and did not represent hookworm disease.

A survey of hookworm infection in 4,000 male separatees at Fort McPherson, Ga., conducted under the auspices of the Tropical Disease Control and Laboratories Branch, Office of the Surgeon General,[4] revealed a prevalence of 13.5 percent in troops with oversea service, in contrast to 7.5 percent in those with service in continental United States only. Very few infected troops had egg counts exceeding 5,000 per gram. The prevalence of hookworm infection in troops who served in the following theaters was as follows: European theater, 13.8 percent; Pacific, 13.0 percent; China-Burma-India theater, 11.3 percent; and Western Hemisphere tropics, 7.4 percent. Among troops who served in the European theater and in the Pacific areas, the incidence was 12.7 percent.

Prevalence of 39.2 percent hookworm infection in the 13th Engineer Battalion, 7th Division, on Okinawa, was reported.[5] This organization had previously been in combat on Leyte. Rogers and Dammin[6] reported that, although they had no reliable data on the actual incidence of hookworm infection among troops in north Burma during the summer and fall of 1944, the amount of infection of troops who served in forward areas there must have been considerable. A relatively acute syndrome of abdominal pain, anorexia, nausea, vomiting, diarrhea, and weight loss was observed in soldiers who had high eosinophilia and hookworm infection. *A. duodenale* infections predominated. The severity of clinical symptoms was considered disproportionate to the worm burden which was judged to be small in most cases. A survey of intestinal parasites of troops in the 32d Division in New Guinea, conducted in 1943, revealed an increasing prevalence of 5.8 percent in April, 13.5 percent in May, 12.7 percent in June, 18.1 percent in July, and 17.5 percent in August.[7]

Hookworm infection in the South Pacific appeared to have been acquired largely during combat.[8] The extent of infection among troops was in direct proportion to the length of the time they had spent in combat. It was increased among those who had occupied native villages and captured enemy bivouac areas. As an example, an infantry division which served in both the Guadalcanal and the New Georgia campaigns had a much higher incidence than divisions which had battle experience only in the latter campaign. In combat, troops lived on the ground and slept in foxholes. Clothing was damp most of the time from the wet foxholes, rain, or perspiration. Bathing was

---

[4] Survey of Intestinal Parasites in Soldiers Being Separated From Service. Bull. U.S. Army M. Dept. 6: 259–262, September 1946.

[5] Medical Bulletin No. 19, Office of the Surgeon, Headquarters, Army Service Command I, Okinawa, 17 Sept. 1945.

[6] Rogers, A. M., and Dammin, G. J.: Hookworm Infection in American Troops in Assam and Burma. Am. J.M. Sc. 211: 531–538, May 1946.

[7] Report, 3d Medical Laboratory, August 1943, subject: Survey of Intestinal Parasites of the 32d Division.

[8] (1) Liebow, A. A., and Hannum, C. A.: Eosinophilia, Ancylostomiasis, and Strongyloidosis in the South Pacific Area. Yale J. Biol. & Med. 18: 381–403, May 1946. (2) Hookworm Infection in South Pacific Area. Bull. U.S. Army M. Dept. 4: 372–373, October 1945.

impossible for periods as long as 30 days. Frequently, no change of clothing was possible. Socks were issued on occasion, but in 2 or 3 hours they were wet. Shoes deteriorated rapidly because of the constant dampness. Feces were disposed of by digging individual holes with entrenching tools; some deficiency was noted in this respect. It was to be expected that infantry troops which had the most intimate foxhole contact with the soil would have the highest incidence. The stretcher bearers of medical detachments of infantry battalions had a similarly high rate of infection. The incidence in headquarters, field artillery, and service and garrison troops was lower than in infantry and combat medical troops.

The hookworm burden among troops generally was relatively light, as indicated by the fact that Stoll egg counts averaged between four and eight thousand eggs per cubic centimeter. The majority of infected individuals made no complaints of symptoms. Evidence of acquisition of hookworm infection in troops in Pacific islands was also reported by Zarrow and Rifkin [9] and by Zinneman.[10] May [11] reported a 35-percent prevalence of hookworm infection in 400 U.S. soldiers interned for more than 3 years by the Japanese. Prevalence ranging from 20 to 48 percent was recorded in insular troops assigned to the Panama Canal Department and in Puerto Rican troops stationed in California. Infections in most cases were light, since routine stool examination and anthelmintic therapy had been given following induction. Had such examinations not been made, the infection rate and hookworm burden probably would have been much higher.[12]

Relation Between Eosinophilia and Hookworm Infection

The relationship between hookworm infection and eosinophilia was the subject of several investigations in the South Pacific. On the basis of these studies, it was concluded that, despite inaccuracies due to eosinophilia from other causes, eosinophilia could be used as an indirect criterion of the incidence of hookworm infection, when mass stool examination was impracticable.[13] An eosinophilia of 6 percent or higher was taken as sufficient evidence of hookworm infection to justify treatment. Studies including two stool examinations made at the 39th General Hospital, Auckland, New Zealand,

---

[9] Zarrow, M., and Rifkin, H.: Intestinal Parasites Diagnosed at an Army General Hospital in the South Pacific. Am. J.M. Sc. 212: 289–293, September 1946.

[10] Zinneman, H. H.: Ankylostomiasis. Nebraska M.J. 32: 185–186, May 1947.

[11] May, E. L.: Parasitologic Study of 400 Soldiers Interned by the Japanese. Am. J. Trop. Med. 27: 129–130, March 1947.

[12] (1) Professional History of Internal Medicine in World War II, 1 January 1940 to 1 October 1945, The Panama Canal Department, vol. II, pp. 251–254. [Official record.] (2) Report, G. H. Houck, P. L. Burlingame, M. S. M. Watts, and J. T. Marconis; 4th AA Command, 5 Aug. 1945, San Francisco, Calif., subject: Report of Disinfestation Program in 762d and 891st AA Gun Bns. (3) Letter, Lt. Col. J. L. Crary, Adjutant, 37th Antiaircraft Artillery Brigade, Coast Artillery Corps, to Commanding Officer, 891st and 762d Antiaircraft Artillery Gun Battalions, 29 June 1945, subject: Disinfestation of Personnel With Intestinal Parasites. (4) History of Medical Department Activities, Antilles Dept., Preventive Medicine, pp. 58–65. [Official record.]

[13] Stevens, Frank W.: [History, World War II] Medicine—South Pacific Area, pp. 24–25. [Official record.]

upon troops long in combat in the Solomon Islands, showed that 79 percent of those with an eosinophilia of 9 percent or above had hookworm ova in their stools. The blood studies indicated that at least 236 out of 1,000 in the command probably were infected with hookworm. In a smaller series of 50 selected soldiers studied at the 8th General Hospital, Dumbea Valley, New Caledonia, the range of eosinophilia was from 4 percent to 77 percent. Examination of three stools from each of these soldiers revealed hookworm infection in 98 percent of the group.

Brig. Gen. Earl Maxwell, Surgeon, USAFISPA (U.S. Army Forces in the South Pacific Area),[14] directed that, in view of the apparent prevalence of hookworm in troops in South Pacific islands, it was important that all patients admitted to a hospital have a differential leukocyte count and at least one examination of the stool for parasites. In the presence of eosinophilia of 6 percent or above, presumptive evidence of hookworm was strong, and repeated examinations of the stool were indicated. It was the policy in this theater to investigate and treat hookworm disease in combat troops during periods of rehabilitation. However, surgeons responsible for the medical care of service troops and small combat organizations were urged to arrange eosinophilic surveys as soon as possible. Surgeons were directed to arrange for blood examinations to be made in permanent medical installations. In large numbers of troops thus surveyed, an eosinophilia of 6 percent or above was considered sufficient evidence of hookworm disease to justify treatment.

Psychoneurosis.—The differentiation of manifestations of hookworm infection and of psychoneurosis created a diagnostic problem in some areas. Denhoff[15] reported that a large Army station hospital with 36 months' service in the South Pacific and Southwest Pacific had a substantial number of patients with high degrees of eosinophilia, the causes of which were not being determined by routine methods. During the period 1944 to 1945, while located in New Guinea, the medical and laboratory services established a ward for cases of unexplained eosinophilia in order to study hospital patients on whom laboratory studies did not clarify the cause of eosinophilia. Fifty-nine U.S. soldiers were studied in this group. Forty-seven (80 percent) were found to have intestinal helminths. Forty-two (71 percent) had hookworm infection. Five (8 percent) were infected with *Strongyloides stercoralis*. Twelve (20 percent) presented no demonstrable cause of the eosinophilia. The majority of patients were admitted to the hospital with abdominal complaints. A substantial number were classified as psychoneurotic prior to study. The predominant symptoms were intermittent cramplike epigastric pain, anorexia, nausea, vomiting, weakness, fatigue, nervousness, and weight loss. It was the opinion of Denhoff that the diagnosis of psychoneurosis may not have been warranted in troops with the syndrome described above.

---

[14] Medical Circular Letter No. 15, Office of the Surgeon, Headquarters, USAFISPA, 2 Feb. 1944, subject: Hookworm.

[15] Denhoff, E.: The Significance of Eosinophilia in Abdominal Complaints of American Soldiers. New England J. Med. 236: 201–206, February 1947.

The Problem of *Ancylostoma duodenale*

From the examples of studies and experiences with hookworm infection in U.S. Army troops stationed overseas, it is apparent that infections with *A. duodenale* were numerous. Although there is evidence that some of the infections were clinically significant, the majority of cases were asymptomatic and did not constitute a military problem of great magnitude. Provision of an adequate diet sufficient in iron probably helped to keep many hookworm infections at a subclinical level and to prevent the development of severe hookworm disease. According to Lt. Col. (later Col.) Francis R. Dieuaide, MC,[16] it is unlikely that the health of military patients suffered in any significant degree from this infection. Hookworm infections are rarely serious for the individual who receives adequate treatment such as was given in the Armed Forces. As for the potential military significance of hookworm infection, Maj. (later Lt. Col.) Averill A. Liebow, MC, and Lt. Clair A. Hannum, SnC,[17] speculated that subclinical hookworm infection might become hookworm disease if dietary intake of troops should become bad. Reexposure by repeatedly sending troops already infected in mass into new campaigns on contaminated soil might also reduce the efficiency of the military machine significantly.

Native populations in areas where sanitation was inadequate provided a reservoir of hookworm infection and constituted a hazard to troops stationed near their villages. Surveys conducted before World War II, recording the geographic distribution of hookworm infection in tropical Pacific islands, were summarized by Mumford and Mohr.[18] During the war, medical laboratories, and particularly malaria survey units, conducted numerous surveys for intestinal parasites among natives in areas of troop concentrations. A survey of the 32d Malaria Survey Unit[19] demonstrated a 91-percent prevalence of hookworm infection in a native labor camp at Nadzab, New Guinea. Of 282 fecal examinations from the civilian population adjacent to Tacloban airstrip in the Philippines, 74 percent were positive for hookworm ova.[20] Following the Makin and Kwajalein operations in 1944, a survey for intestinal parasites was conducted among the natives and prisoners of war. The series included 83 Japanese prisoners and 244 Korean laborers from the Gilbert and Marshall group. The prevalence of hookworm infection for the two groups was 26.5

---

16 Dieuaide, F. R.: Wartime Experience With Tropical Diseases and Their Future Significance. Tr. A. Life Insur. M. Dir. America 30: 220–238, October 1946 (1947).

17 See footnote 8(1), p. 18.

18 Mumford, E. P., and Mohr, J. L.: Manual on the Distribution of Communicable Diseases and Their Vectors in the Tropics, Pacific Islands Section, pt. I. Am. J. Trop. Med. 24: (Supp.) 1–26, May 1944.

19 (1) Letter, Karl V. Krombein, Headquarters 32d Malaria Survey Unit, Unit I, to Commanding General, Far East Air Force, 25 June 1944, subject: Survey of Native Populations in the Nadzab Area for Intestinal Helminths, I. Native Laborers at the ANGAU Native Labor Camp, Nadzab. (2) Bern, H. A., and Hansen, M. F.: Parasitic Infections Among Natives of the North Markham Area. New Guinea J. Parasitol. 36: 103–106, April 1950.

20 Semimonthly Report of Activities of the 19th Medical Service Detachment (General Laboratory), 1–15 Mar. 1945.

and 34.4 percent, respectively.[21] It is obvious that a potential source of hookworm infection for troops was present in many tropical areas.

The medical services stationed overseas and in the United States were kept informed of the frequency with which troops were acquiring hookworm infection. The common modes of exposure of troops were explained. Information and recommendations for the diagnosis, management, and prevention of hookworm infection were disseminated by various circular letters,[22] articles published in the *Bulletin of the U.S. Army Medical Department*,[23] and technical manuals.[24] The following factors, instructions, and policies were relied upon to prevent and to minimize the severity of hookworm infection in troops: Wearing of shoes, intake of an adequate diet to compensate for blood loss and thus prevent or reduce clinical manifestations, avoidance insofar as possible of intimate contact with moist ground, avoidance of the use of native villages and abandoned or captured enemy bivouac areas as campsites, treatment of infected troops including mass treatment during periods of rehabilitation between combat engagements, and proper disposal of excrement even under combat conditions. During the war, consideration was given to research on control of hookworm infection through treatment of soil. Soil fumigants were considered impracticable for field use. Therefore, since other projects had higher priority and greater promise, no research along this line was undertaken.

Precautions against importation of *A. duodenale* into the United States.—The danger of implanting *A. duodenale*, the Old World hookworm, in the United States, where it was not endemic, was stressed by many persons including Wright,[25] Loughlin and Stoll,[26] and McCoy.[27] This matter was of public health importance in the United States. *A. duodenale* is more harmful to the host and less amenable to treatment, and its free-living stages are more resistant to climatic conditions than are those of *N. americanus*. It was estimated that 1 in 15 servicemen returning from the Pacific was infected with *A. duodenale*. Also, an analysis of hookworm infections in U.S. servicemen from the South suggested the persistence in young adulthood of faulty hygienic habits acquired in childhood. In returned servicemen, the occurrence of a significant incidence of *A. duodenale* infection, combined with evidence

---

21 History of Internal Medicine in the Central Pacific in World War II, pp. 219–225. [Official record.]

22 (1) See footnote 14 (p. 20). (2) Circular Letter No. 33, Office of the Surgeon General, U.S. Army, 2 Feb. 1943, subject: Treatment and Control of Certain Tropical Diseases.

23 (1) Hookworm Infection in the Pacific Area. Bull. U.S. Army M. Dept. No. 78, pp. 3–4, July 1944. (2) The Management of Hookworm Infection. Bull. U.S. Army M. Dept. 4: 660–661, December 1945.

24 War Department Technical Manual 8–210, Guides to Therapy for Medical Officers, sec. VI, Treatment and Control of Certain Tropical Infections, par. 59, Hookworm Infections, 20 Mar. 1942.

25 Wright, W. H.: Present and Post-War Health Problems in Connection With Parasitic Diseases. Science 99: 207–213, March 1944.

26 Loughlin, E. H., and Stoll, N. R.: Hookworm Infections in American Servicemen With Reference to the Establishment of Ancylostoma Duodenale in the Southern United States. J.A.M.A. 136: 157–161, January 1948.

27 McCoy, O. R.: Precautions by the Army to Prevent the Introduction of Tropical Diseases. Am. J. Trop. Med. 26: 351–355, May 1946.

of continuance of practices favorable for dissemination of hookworm, increased the suspicion that this species of hookworm may have an opportunity to establish itself in endemic areas of *N. americanus* infection in the South.

McCoy pointed out that an attempt to remove every single hookworm from troops returning to the United States was not considered practicable because of the difficulties of examining and treating such a large group of men and because repeated treatment may be necessary to effect complete cure. However, it was realized that the possibility of establishment of *A. duodenale* in extensive areas in this country would be materially lessened if the number of worms introduced by returning troops was kept to a minimum. Consequently, survey and treatment of troops, especially those in combat units exposed to infection, were encouraged before departure from abroad. Also, McCoy recommended that individuals who had been treated for hookworm in the previous 6 months should be examined at time of discharge and given additional treatment if hookworm eggs were found. On 1 October 1945, a letter was addressed to the Commander in Chief, USAFPAC (U.S. Army Forces in the Pacific), by The Surgeon General, in which the following steps were suggested to minimize the possibility of introduction and establishment of *A. duodenale* infections in the United States from the Pacific: (1) Survey of representative samples (5 to 10 percent) of units to determine those in which an appreciable amount of hookworm infection had been acquired, (2) stool examination of all individuals in units in which the survey showed a prevalence of infection of more than 5 percent, and (3) treatment of all individuals found positive on stool examination. Col. Paul I. Robinson, MC, Deputy Chief Surgeon, USAFPAC, directed on 17 October 1945 that the hookworm detection and removal procedures suggested in the 1 October 1945 letter from The Surgeon General should be effected as far as practicable in troops departing for the United States.

SUMMARY

Between 1942 and 1945, there were 22,238 admissions for hookworm infection in the U.S. Army. The hookworm burden in most of the troops was light, but some of the infections were clinically significant. The majority of patients admitted for hookworm became infected overseas. Admission rates were 0.53 for soldiers in the continental United States and 1.35 for oversea forces. Many troops acquired infection with *A. duodenale*, the Old World hookworm, which was not endemic in the United States. Areas with the highest admission rates were the Southwest Pacific, Latin America, the Central and South Pacific, and China-Burma-India. No deaths in U.S. troops were attributed to hookworm disease. Admissions for hookworm may be considered relatively low. This interpretation seems justifiable in view of the large number of troops sent to the tropics, the nature of their military activities which frequently resulted in unavoidable exposure, and the prevalence of infection in

some troops who had resided in endemic hookworm areas in the Southern United States and Latin America before military service.

Hookworm infection in the South Pacific appeared to be acquired largely during combat. Infantry troops and combat medical troops acting as stretcher bearers had the highest infection rates. Occupation of native villages and captured enemy bivouac areas resulted in increased infection. In combat, troops lived on the ground and often slept in wet foxholes. Under frontline combat conditions in the tropics, intimate contact with moist soil was unavoidable. Some deficiency in proper excreta disposal was reported.

Eosinophilia was used in one theater as an indirect criterion of hookworm infection when mass stool examination was impracticable. An eosinophilia of 6 percent or higher was taken as sufficient evidence of hookworm infection to justify treatment. This procedure, though expedient, would result in missing many other causes of eosinophilia, particularly strongyloidiasis. In the South Pacific, combat troops were surveyed and treated for hookworm infection during periods of rehabilitation. The differentiation of manifestations of hookworm infection and of psychoneurosis created a diagnostic problem in some areas. The provision of an adequate diet for Army troops probably contributed significantly to the prevention of severe hookworm disease. If the dietary conditions of troops should become inadequate, subclinical hookworm infection might reach the level of hookworm disease.

It has been estimated that 1 in 15 servicemen returning from the Pacific was infected with *A. duodenale*. The Preventive Medicine Service, Office of the Surgeon General, was cognizant of the possibility of introduction of this species of hookworm in the United States by repatriated troops. Treatment of heavily infected oversea units prior to their return was urged to minimize the possibility of establishment of *A. duodenale* in the United States. No endemically acquired infections with this species in the United States were reported during the war years.

Important measures which were employed to minimize the medicomilitary significance of hookworm infection were as follows: Wearing of shoes, avoidance insofar as possible of intimate contact with moist ground, avoidance of the use of native villages and captured enemy bivouac areas as campsites, proper disposal of excreta even under combat conditions, survey and treatment of infected troops during rehabilitation periods between combat engagements, intake of an adequate diet to prevent or reduce clinical manifestations, and instruction of troops and of line and medical officers in proper preventive and control measures.

CHAPTER IV

Leprosy

James A. Doull, M.D., Dr. P.H.

EPIDEMIOLOGY

The importance of leprosy as a military problem is limited by certain of its epidemiological characteristics. The most pertinent of these are geographic distribution, low prevalence rates even in areas in which the disease is considered to be highly endemic, and relatively low attack rates in adult life.

For practical purposes, leprosy may be considered a disease of the tropics and subtropics. Rogers and Muir [1] emphasize that every country with high prevalence rates is situated within the tropics and that such tropical countries are inhabited mainly by backward people living in overcrowded huts under conditions favorable to the spread of the disease.

Every country with a very high leprosy rate, that is, 5 or more cases per 1,000 of the population, is situated within the tropics. In practically all, the climate is hot and damp. The tropical belt of Africa is considered to have the highest prevalence rate in the world. In the Belgian Congo, for example, there are over 60,000 patients under treatment, or about 6 patients per 1,000 of the population, and Rogers and Muir estimate a total prevalence of 20 per 1,000. In tropical Asia and Oceania, estimated rates are about 2 or 3 per 1,000 for Indonesia and the Philippines. Rates in French Oceania are estimated to be higher. In South America, estimated rates are highest in French Guiana (14.7), Dutch Guiana (6.75), Paraguay (4.4), Colombia (3.7), and British Guiana (3.0). Brazil and Venezuela have rates of between 1 and 2 per 1,000. Rogers and Muir point out that the northern and southern subtropical zones, from latitudes 23°30′ to 35°, are widely infected with leprosy but have few areas with prevalence rates higher than 1 per 1,000. Important exceptions are parts of India, southern China, and southern Japan—areas with comparatively high rainfall. The estimated rates for India and Burma are between 3 and 4 per 1,000. The total number of cases in India and Burma probably exceeds 1,200,000 and constitutes perhaps one-third or one-fourth of the world's total cases.

Leprosy has the peculiar characteristic of occurring in "clusters" rather than being evenly spread. In the Philippines, the Bureau of Health and the Leonard Wood Memorial (American Leprosy Foundation) have been carrying

[1] Rogers, Sir Leonard, and Muir, E.: Leprosy. 3d ed. Baltimore: Williams & Wilkins Co., 1946.

on epidemiological studies [2] for 20 years in selected localities in Cebu, which is considered to be the most heavily infected province of the Republic. In two areas of highest prevalence, where practically every inhabitant has been examined on at least two occasions, the prevalence rate has been found to be slightly under 20 per 1,000. A mitigating factor in these areas is that the lepromatous type, which is chiefly responsible for spread of the disease, constitutes less than one-half of the total. In India and certain other parts of the world, the lepromatous type constitutes an even lower proportion of total leprosy. In the United States, most of the patients suffer from the lepromatous type (fig. 2).

FIGURE 2.—Patient with lepromatous leprosy. A. Before treatment, 18 October 1956. B. After treatment, 18 May 1959. (Courtesy of U.S. Public Health Service Hospital, Carville, La.)

The only known sources of leprosy are persons suffering from the disease. The chance of encountering such sources in the general population is manifestly quite low even in areas of high prevalence. Military interest centers chiefly on the chance of contact with persons with the lepromatous type, and it is improbable that many more than 1 person in 100 is affected with this type in any country in the world.

---

[2] (1) Doull, J. A., Guinto, R. S., Rodriguez, J. N., and Bancroft, H.: The Incidence of Leprosy in Cordova and Talisay, Cebu, P.I. Internat. J. Leprosy 10: 107–131, December 1942. (2) Guinto, R. S., Doull, J. A., Bancroft, H., and Rodriguez, J. N.: A Field Study of Leprosy in Cordova, Philippines; Resurvey in 1941 After Eight Years. Internat. J. Leprosy 19: 117–135, April–June 1951.

So little is known regarding susceptibility to leprosy of various age groups that broad generalizations on the subject should not be made. In countries in which the disease is endemic, the infection is usually contracted in childhood. In the Philippine studies referred to, it was found that for total leprosy the incidence rate, as distinguished from the prevalence rate, reached its peak at ages 10 to 14, when it was 3.7 per 1,000 per year, that at ages 20 to 29 the rate was 2.0, and that at ages 30 to 50 it was about 1.0.

LEPROSY IN THE ARMY BEFORE WORLD WAR II

There are no records of leprosy occurring in the United States Army before the Spanish-American War. The Revolutionary War was fought in areas in which the disease was rare or absent. During the War of 1812, troops were engaged in New Orleans in the vicinity of an old endemic focus, but the number of men involved was small and the duration of the conflict short. If cases occurred either during or following the war, the incomplete medical records of the period do not mention them. The Mexican War of 1846 involved possible exposure of appreciable numbers of soldiers for about 2 years. Records are available in some detail, but leprosy is not mentioned as having occurred during the war or in the period which followed. Nevertheless, as Aycock and Gordon [3] comment, the disease may well have occurred years later among veterans of the Mexican campaign and the association with military service may have been overlooked. The Civil War was fought chiefly in nonendemic areas; no cases of leprosy were reported.

The earliest records of leprosy in the armed services of the United States relate to cases in men who served in the Spanish-American War, the Boxer Rebellion, or the Philippine Insurrection. Actually, the cases did not occur during the hostilities; they were reported at intervals over several subsequent decades, and the onset dates are not known with exactness. One or perhaps two of the cases may have occurred as early as 1901, according to Aycock and Gordon. From 1921 to 1940, 32 veterans were admitted to the U.S. Marine Hospital, or National Leprosarium, at Carville, La. Of these, 28 had served in the Army, 3 in the Navy, and 1 in the Marines. Thirty patients had had military service outside the United States in places known to be focuses of leprosy; 25 of the 30 had served in the Philippines. There is no record of foreign service for two of the patients; one was born in Louisiana and the other in Texas. Five were born outside the continental United States; 19 were born in parts of the United States where the disease rarely occurs. For 18 of the latter, Aycock and Gordon state that the periods of service in endemic areas ranged from 9 months to 32 years. Hasseltine [4] has emphasized the fact that a large portion of the Spanish-American War veterans who had been

---

[3] Aycock, W. L., and Gordon, J. E.: Leprosy in Veterans of American Wars. Am. J. Med. Sc. 214: 329–339, September 1947.

[4] Hasseltine, H. E.: Leprosy in Men Who Served in United States Military Service. Internat. J. Leprosy 8: 501–508, October–December 1940.

admitted to the National Leprosarium were born in nonendemic areas and that the average age on admission of the entire group of Spanish-American War veterans was 52. The dates at which first signs of the disease are stated to have appeared ranged from 1901 to 1938, but, of 27 patients for whom dates are given, all except 4 are stated to have observed their first symptoms after 1910. It should be noted that a number of veterans who developed the disease had remained in the Philippines in military or civilian capacity for some years following termination of the war.

From 1921 to 1940, 51 World War I veterans were admitted to the National Leprosarium. Forty-one had service in the Army, one in the Students Training Corps, eight in the Navy, and one in the Marine Corps. Records show that 33 had no service outside the continental United States, 12 had served in France, 2 in Mexico, and 1 each in Hawaii, Panama, the Philippines, and Puerto Rico. There were 18 who had been born outside the continental United States, and, of the remaining 33, 15 had been born in Louisiana, 10 in Texas, 5 in Florida, 2 in Mississippi, and 1 in Georgia. None had been born in the Northern States. Age on admission to the Leprosarium averaged 33.2 years and ranged from a minimum of 22 to a maximum of 43 years. In 35 patients, or 68.6 percent, the first signs of the disease are said to have been noticed during the years 1917 to 1923, inclusive.

PREVENTIVE MEASURES DURING WORLD WAR II

Because of the lack of knowledge about the mode of spread of the disease and because there were no effective vaccines or chemical prophylactics, there was not much that the Preventive Medicine Service, Office of the Surgeon General, could do to provide protection against leprosy for troops and other military personnel. Dependence for protection had to be placed almost entirely upon recognition of the disease when it occurred and upon avoidance of contact. At the same time, measures were invoked to counteract the fears, the military and public alarm, and the dangers of irrational behavior that were aroused by age-old superstitions about the disease. The Preventive Medicine Service recognized that leprosy, because of its long latency and low incidence of adult infection, could not be a disease of military significance insofar as loss of manpower during World War II was concerned. It was recognized also that the area of exposure was vastly extended and that the number of possible contacts was increased by large multiples by the placing of thousands of U.S. soldiers among populations where incidence of leprosy was high, particularly in the Pacific regions. The late consequences of acquisition of leprosy during the war by soldiers exposed in the course of their service were also matters of grave concern. A balanced program designed to stimulate awareness of the disease and at the same time to support reasonable precautionary measures was adopted. The program of such preventive measures was carried out by the assembly and dissemination of information.

The prevention of contact of military personnel with leprous persons within the service had been a longstanding practice, specified by Army regulations. Leprosy was a fixed basis for rejection of men coming up for induction through enlistment or draft. In spite of provisions for rejection on account of leprosy, the records, examined later, showed that 15 men infected with leprosy before 1941 were inducted into the Army during World War II. Of these, five were men who had been discharged from the National Leprosarium as "arrested cases." The other 10 men were from various parts of the United States and Hawaii and, at various periods after induction, were discovered to have leprosy (pp. 31–32). No secondary cases among military personnel are known to have arisen from these sources.

During 1942 and the first half of 1943, an increasingly close and mutually beneficial relationship developed between the Preventive Medicine Service and the Leonard Wood Memorial. The president of the Memorial, Mr. Perry Burgess, urged that a survey of the distribution of leprosy throughout the world be made and offered his personal services and the services of the Memorial. These offers were accepted. Mr. Burgess was appointed consultant to the Secretary of War. In the Preventive Medicine Service of the Office of the Surgeon General, the undertaking of assembling and issuing information was made a cooperative project of the Medical Intelligence Division, the Epidemiology Division, and the Commission on Tropical Diseases of the Army Epidemiological Board. The survey and collaborative work with the Leonard Wood Memorial were conducted chiefly through the Commission on Tropical Diseases. The official information was prepared for the Office of the Surgeon General by preventive medicine staff personnel in that office.

As a result of these studies and efforts, two important publications were issued. The first was Circular Letter No. 180, dated 30 October 1943, on the subject of leprosy, published by the Office of the Surgeon General for distribution to all medical officers. The product of many consultations, this circular letter presented in summary form the latest available knowledge about the disease—its prevalence, geographic distribution, recognition, differential diagnosis, etiological agent, source of infection, incubation period, communicability, susceptibility and immunity, and treatment and control. Regarding control, the following statement was made:

> * * * Recognition of the early clinical manifestations is of the greatest importance with confirmation of diagnosis where possible by bacteriologic examination. Immediate segregation should be carried out. All cases in troops should be reported to The Surgeon General and held in isolation pending final disposition. Medical officers should make inquiry locally concerning the existence of highly endemic foci, and such areas should be avoided where possible. Military personnel should be excluded from any dwelling in which a leprous person lives or is known to have lived recently. In endemic areas all prospective native food handlers and personal attendants should be carefully inspected and if known or suspected of having leprosy should not be employed in handling food or rendering other personal service.

The information gathered and analyzed by the staff of the Leonard Wood Memorial was made available to the Preventive Medicine Service and was used

in connection with military operations in areas in which leprosy was endemic. The final assembly, with data on geographic features, populations, leprosaria, and citations of specific publications, was arranged and edited by the author and was published by the Western Reserve University Press as a supplement to the December 1944 issue of the *International Journal of Leprosy* under the title, "World Wide Distribution and Prevalence of Leprosy."

INCIDENCE IN MILITARY PERSONNEL DURING AND SUBSEQUENT TO WORLD WAR II

Preliminary data for the Army indicate that 26 cases of leprosy occurred during the period 1942–45. Of these, 13 were in the United States and 13 overseas. The distribution by area is given in table 4.

TABLE 4.—*Total cases of leprosy in the U.S. Army, by theater or area and year, 1942–45* [1]

[Preliminary data based on individual medical record tabulations of admissions, secondary diagnoses, and discharges]

Theater or area	1942–45	1942	1943	1944	1945
	Number	*Number*	*Number*	*Number*	*Number*
Continental United States	13	4	7	1	1
Overseas:					
Europe	1				1
Mediterranean	2			2	
Southwest Pacific	1			1	
Central and South Pacific	8	5		2	1
Latin America	1				1
Total overseas	13	5		5	3
Total Army	26	9	7	6	4

[1] The annual case rates per 1,000 average strength were all less than 0.005, with the following exceptions: The 1942 rate overseas was 0.01; the 1942 rate in the Central and South Pacific, 0.03; and the 1945 rate in Latin America, 0.01.

Efforts were made to obtain individual case histories of all patients in whom a diagnosis of leprosy was confirmed and who had served in any branch of the armed services of the United States. The author personally searched the records of the National Leprosarium, and additional data were provided by the president of the Board of Health of Hawaii and by the Secretary of Health of the Philippines. Doubtless there are some omissions. The total number of patients on record to 31 July 1951 was 69. Of these, 20 were diagnosed in the Army during the period 1942–45, as compared with 26 shown in table 4. The distribution of these 69 cases according to year of diagnosis and branch of the armed services is given in table 5.

It is not surprising, considering the rapid mobilization during the early years of World War II, that a few patients who had been discharged from the National Leprosarium in an arrested condition were inducted; nor was it sur-

TABLE 5.—*Cases of leprosy occurring in the Armed Forces of the United States during World War II and in veterans, 1 January 1942 to 31 July 1951*

Year of diagnosis	Total	Army		Navy		Marine Corps	Coast Guard
		In service	After discharge	In service	After discharge	After discharge	After discharge
	Number	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*
1942	6	5	1				
1943	7	5	2				
1944	9	6	3				
1945	11	4	6				1
1946	[1] 7		5		2		
1947	9	2	4	1	1	1	
1948	6	2	4				
1949	7	2	4		1		
1950	3		2	1			
1951	4		3		1		
Total	69	26	34	2	5	1	1

[1] Two cases in veterans of the Marine Corps, discovered in 1946 and reported as following tattooing, are not included. These patients were not admitted to a leprosarium. (See Porritt, R. J., and Olsen, R. E.: Two Simultaneous Cases of Leprosy Developing in Tattoos. Am. J. Path. 23:805–811, September 1947.)

Source: Records of the National Leprosarium and of leprosaria in Hawaii and the Philippines.

prising to find that some individuals with lesions of leprosy had been overlooked in the necessarily hurried medical examinations. The case records of all 69 patients have been tabulated to show the time of onset in relation to induction (table 6).

TABLE 6.—*Cases of leprosy occurring in the Armed Forces of the United States during World War II and in veterans, 1 January 1942 to 31 July 1951*

Time of onset	Total	Army	Navy	Marine Corps	Coast Guard
Antecedent to active service:	*Number*	*Number*	*Number*	*Number*	*Number*
Known	5	5			
Probable	10	10			
During active service	31	29	2		
Subsequent to active service	23	16	5	[1] 1	[2] 1
Total	69	60	[3] 7	1	1

[1] This patient was born in Montana and lived there exclusively before enlistment in 1939. There is no history of leprosy among his relatives. From 1939 to 1942, he was stationed at San Diego, Calif. From September 1942 to December 1943, he served in American Samoa. First symptoms were noted in the fall of 1945, and a diagnosis of tuberculoid leprosy was made in September 1947.

[2] This patient was born in Hawaii.

[3] Includes 2 patients born in the Philippines, 1 in Hawaii, and 1 each in California, Florida, Louisiana, and Texas. Of the 4 born in the continental United States, 3 have histories of previous leprosy in their families; in the fourth, onset occurred within 6 months following enlistment.

Of the 15 patients with Army service either known or considered from their histories to have contracted the disease before enlistment or induction (table 6), 5 had been admitted to the National Leprosarium—1 in 1935, 2 in 1937, and 2 in 1940. All of the 10 others considered to have had the disease before entering the Army had had less than 2 years' service:

Number of patients:	*Length of service (months)*
1	Less than 1.
1	3
2	4
1	5
1	6
1	10
3	Slightly less than 24.

According to their records, all, except one Hawaiian patient for whom the only available information is that the disease was noticed during the month of induction, had had definite evidence of leprosy before entering the Army. In one case there is evidence that the disease was present at the age of 10 years.

Among the 45 patients in whom the first signs of the disease were observed either during or subsequent to Army service, it is known that 7 had prior contact with leprosy within the family, a factor which certainly should be given priority in determining the probable source of the disease. Five had been exposed to the disease through contact with one or more siblings known to have had leprosy, one through association with a parent and one through contact with an uncle and two cousins known to have had the disease. The records of the remaining 38 patients with Army service have been classified to show birthplace and theater of service (table 7). The average age at onset for those born in endemic areas was 27.2 years. For 13 who had served in nonendemic areas, it was 26.5 years and for 19 who had served in endemic areas, 27.6 years. On the other hand, the average age at onset of the six patients born in nonendemic areas was 42.5 years. Other facts of interest in the data concerning these six patients are shown in the case reports which follow.

Case 1.—White man, born in Arkansas on 16 March 1911. Family moved to Sweetwater, Tex., when patient was 4 years old. Family history negative. Enlisted in Army on 15 June 1938; discharged on 13 March 1946. Was prisoner of war in the Philippines 1941–45, confined at Cabanatuan and also Bilibid (Manila). About April 1950, noticed "spot" on left foot, size of 50-cent piece. Admitted to National Leprosarium on 19 January 1951. Diagnosis: Tuberculoid leprosy.

Case 2.—White man, born in Arizona on 23 April 1910. Reared in Mexican section of Tucson. Moved to Los Angeles when 12 years old. Family history negative. Became professional boxer, toured United States, fought in Mexico City 1932–33. Enlisted in Army on 17 September 1940; discharged on 2 October 1941. Reenlisted on 12 December 1941; redischarged on 25 March 1944. Served in United States only. Onset occurred about March 1942. Admitted to National Leprosarium on 9 December 1944. Note on Carville record states that patient was honorably discharged with nervous and mental disorder. Diagnosis: Lepromatous leprosy.

TABLE 7.—*Patients in whom leprosy was diagnosed in the U.S. Army, during World War II or between time of Army service and 31 July 1951* [1]

Birthplace	Total	Area of service	
		Nonendemic area [2]	Endemic area [3]
Nonendemic areas:	*Number*	*Number*	*Number*
Arkansas	1	----------	1
Arizona	1	1	--------
Indiana	1	1	--------
Mississippi	1	----------	1
Missouri	1	----------	1
Ohio	1	1	--------
Endemic areas:			
California	3	3	--------
Florida	2	1	1
Louisiana	1	1	--------
Texas	7	3	4
Hawaii	3	1	2
Puerto Rico	1	1	--------
Virgin Islands	1	----------	1
Mexico	3	3	--------
Philippines	10	----------	10
Samoa	1	----------	1
Total	38	16	22

[1] Patients with onset before service or with history of exposure in the family are omitted.

[2] Nonendemic areas constitute continental United States, either alone or in combination with Alaska, Greenland, and Europe.

[3] Endemic areas include North Africa, Hawaii, the Central Pacific, the Philippines, Canal Zone, and Puerto Rico.

Case 3.—White man, born in Indiana on 4 February 1895. Family history negative. Enlisted in Army on 28 June 1916; discharged on 20 October 1920. Reenlisted on 2 December 1920; redischarged on 14 August 1922. Served in United States, chiefly in Texas (San Antonio). Lived in Brownsville, Tex. (endemic area), 1922–42. Reenlisted on 16 February 1942 and served in United States and France. Discharged to enter National Leprosarium on 19 July 1948. Diagnosis: Tuberculoid leprosy.

Case 4.—Negro man, born in Mississippi in 1906. At age of 7 moved to endemic area in Louisiana, his present home. Family history negative. Enlisted in Army on 14 June 1942; discharged on 20 September 1945. Served in Europe and North Africa. Onset occurred in 1944 when "spots" appeared on individual's back and he experienced periods of nervousness. Diagnosis: Leprosy, type not determined.

Case 5.—White man, born in Missouri on 24 September 1894. Family history negative. Enlisted in Army on 14 April 1917; discharged on October 1919. Reenlisted in 1922; retired in 1944. In World War I, served in France and Germany; 1922–34, stationed in Texas, principally at Galveston and San Antonio; 1934–39, Philippines; 1939 (8 months), Texas; 1939–43, Hawaii. Onset occurred about June 1948, with numbness of the right foot and toes; in June 1950, an eruption appeared on the man's body. This man was

said never to have been on sick report in the Army. Admitted to National Leprosarium on 25 August 1950. Diagnosis: Lepromatous leprosy.

Case 6.—White man, born in Ohio on 27 July 1904. Lived in Ohio, 1904–16; Indiana, 1916–22. Family history negative. Enlisted in Regular Army in 1922; discharged in 1925. Reenlisted in 1927; redischarged in 1945. Stationed in Brownsville, Tex., 1922–25 and remained there until 1927. Stationed in San Antonio, Tex., during 1927; Panama, 1928–31; Kansas, 1931–34; San Antonio, 1934–40; California, 1940–41; Oklahoma, 1941; Mississippi, 1942, when leprosy was diagnosed. Onset occurred probably in 1936. A diagnosis of syringomyelia was recorded at an Army hospital in 1939. Admitted to National Leprosarium on 18 August 1946. Diagnosis: Lepromatous leprosy.

While the source of infection can never be stated with certainty, it would appear probable that in cases 2 and 4 the infection was contracted in civilian life. On the other hand, it is quite likely that, in cases 1, 3, 5, and 6, the infection occurred during military service, but the only history which clearly points to exposure during World War II is that of case 1. This patient developed obvious signs of the disease about 6 years after release from a prisoner-of-war camp in the Philippines in which he had been confined for about 4 years.

PROGRESS IN THERAPY DURING WORLD WAR II

Significant advances were made in the therapy of leprosy during World War II. For many years, the standard treatment had been administration of chaulmoogra oil or its esters, and, although there was controversy as to the results, there was nothing better at hand. In 1940, sulfanilamide was given to a group of patients at the National Leprosarium. The report by Faget, Johansen, and Ross [5] stated that, although secondary infections were cleared up, little or no improvement was noted in leprous lesions.

Feldman, Hinshaw, and Moses [6] reported in 1940 that one of the sulfone drugs, which differ from the sulfonamides in having two phenyl groups instead of one and which have in common the diaminodiphenylsulfone radical, had a strikingly deterrent action on tuberculosis in the guinea pig. This drug was Promin, released in soluble form for clinical study in 1938. In March 1941, Faget and his coworkers [7] at the National Leprosarium placed the first group of leprosy patients on Promin. At first it was given orally, and toxic symptoms were so severe that it had to be discontinued. Shortly afterward, a preparation for intravenous use was obtained and found to be well tolerated by a majority of patients in doses as large as 5 gm. daily. Clinical improvement observed was slow but definite; as a rule, it did not become manifest until after 6 months of treatment. Lesions of the mucous membranes of the

---

[5] Faget, G. H., Johansen, F. A., and Ross, Sister Hilary: Sulfanilamide in the Treatment of Leprosy. Pub. Health Rep. 57: 1892–1899, 11 Dec. 1942.

[6] Feldman, W. H., Hinshaw, H. C., and Moses, H. E.: The Effect of Promin * * * on Experimental Tuberculosis: Preliminary Report. Proc. Staff Meet., Mayo Clin. 15: 695–699, 30 Oct. 1940.

[7] Faget, G. H., Pogge, R. C., Johansen, F. A., Dinan, J. F., Prejean, B. M., and Eccles, C. G.: The Promin Treatment of Leprosy. Progress report. Pub. Health Rep. 58: 1729–1741, 26 Nov. 1943.

upper respiratory tract responded well, resulting in restoration of the voice and disappearance of nasal obstruction. Emergency tracheotomies were much less frequently required. Nodules in the skin slowly flattened. Areas of infiltration gradually subsided. Leprous ulcers of the extremities gradually healed. Occasionally, regrowth of hair occurred in the eyebrows, beard, and on the arms and legs. There was little evidence of improvement in eye lesions. Skin and nasal smears remained positive in nearly all patients even after a year of treatment, but there was definite evidence of reduction after 2 years of treatment. Biopsy findings by Fite and Gemar[8] indicated that improvement in skin lesions was not accompanied by characteristic cellular changes. The changes observed were atrophic in character, similar to those observed in spontaneous remission. Slow and gradual disappearance of bacilli was confirmed. Promin appeared to act by eliminating bacillary infection from the blood vessels and bloodstream, thereby preventing formation of new lesions and permitting natural resolution of lesions to take place.

Promin was in part replaced in 1943 by disodium formaldehyde sulfoxylate diaminodiphenylsulfone, first prepared under the name of Diasone. It was given orally in doses as large as about 1 gm. daily. Other sulfones soon came into use, but the results with all of them were more or less equivalent to those obtained with Diasone. It is considered by many that beneficial effects of the sulfones on leprosy are attributable to diaminodiphenylsulfone (DDS), and this so-called parent substance is now being used extensively in Africa, India, and other countries. Its only advantage is its cheapness, and there are differences of opinion regarding its toxicity in therapeutic dosages.

Of the antibiotics, only streptomycin has been used at all extensively. It was used for the first time in leprosy by Faget and Erickson in 1945.[9] The results were about as good as those obtained with the sulfones.

SUMMARY

The geographic distribution of leprosy and the relatively small chance of contact with sources of infection, even in highly endemic areas, limit the military importance of this disease. However, 32 veterans are known to have developed leprosy after the Spanish-American War. A large proportion of these were born in nonendemic areas. Their ages on admission to the National Leprosarium also suggested exposure during Army service, the average age having been 52. There is no evidence that service in the Army in World War I was related to subsequent occurrence of leprosy in veterans. None of the veterans had been born in the Northern States, and the average age at admission to the National Leprosarium was 33 years.

---

[8] Fite, G. L., and Gemar, F.: Regressive Changes in Leprosy Under Promin Therapy. South. M.J. 39: 277–282, April 1946.

[9] Faget, G. H., and Erickson, P. T.: Use of Streptomycin in the Treatment of Leprosy: Preliminary Report. Internat. J. Leprosy 15: 146–153, April–June 1947.

Records have been found of 69 cases in individuals who served in the Armed Forces during World War II. Sixty of these individuals served in the Army, seven in the Navy, one in the Marine Corps, and one in the Coast Guard.

The cases among Navy and Coast Guard veterans are probably not attributable to military service. On the other hand, the Marine Corps veteran probably experienced his effective exposure during military service. Two Marine Corps veterans who have not been hospitalized and who are not included in the total shown are reported to have developed tuberculoid leprosy, the first lesions having occurred in tattoos made during service.

In 15 of the 60 Army leprosy patients, there is evidence that the disease had been present before enlistment or induction, and 5 of the 15 had been treated at the National Leprosarium. Of the other 45 patients, 7 had definite histories of exposure to leprosy in the family. The records of the remaining 38 patients were carefully examined in the search for the probable loci of exposure. It was found that all but six had been born in the areas in which the disease is endemic. While this does not preclude the possibility of exposure during military service, it would seem more probable that the infection occurred at an earlier date. This is supported by the fact that the average age of these patients at time of stated onset was 27.2 years and also by the fact that there was no significant difference in average age at time of onset between those who had served in theaters in which the disease was endemic and those who had not.

The records of the six patients who were born in nonendemic areas indicate that in two instances the infection was contracted in civilian life. In four others, the probability is that infection occurred during military service, but in only one of these is there a clear indication that the effective exposure occurred during World War II.

The experience of the U.S. Army after the Spanish-American War is a strong indication that the leprosy history of World War II is not yet closed and that sporadic cases among veterans may be expected to appear during the next two decades.

During World War II, significant progress was made in the therapy of leprosy. Particularly important was the discovery that prolonged treatment with sulfones gives favorable results in a large proportion of cases.

CHAPTER V

Leptospirosis

Thomas B. Turner, M.D., and Hugh Tatlock, M.D.

Part I. General and Leptospiral Jaundice (Weil's Disease)

Leptospirosis is the collective term applied to a group of diseases caused by micro-organisms of the *Leptospira* genus. The best known of these clinical and etiological entities is Weil's disease or leptospiral jaundice, the etiological agent of which is usually *Leptospira icterohaemorrhagiae.* However, at least six other species of *Leptospira* are known to produce disease in man, and evidence indicates that these infections are much more common than is generally supposed.[1]

Throughout the period of World War II, clinical and laboratory interest in leptospirosis was focused largely on leptospiral jaundice. Although the specific etiological nature of the disease has been known since 1914, both before and since that period leptospiral jaundice has been confused frequently with other diseases in which jaundice is a prominent feature. Weil's disease itself was not an important cause of illness among military personnel in World War II, but the frequency with which it became involved in problems of differential diagnosis makes it worthy of special consideration.

Epidemics of jaundice have occurred in every great war. It seems probable that most of these were epidemics of infectious hepatitis, a disease of viral origin.

---

[1] As indicated by Yager and Gochenour (Yager, R. H., and Gochenour, W. S., Jr.: Leptospirosis in North America. Am. J. Trop. Med. 1: 457–461, May 1952) and by Murphy and Alexander (Murphy, L. C., and Alexander, A. D.: Significance of Leptospiroses in Military Medicine. Mil. Med. 121: 1–10, July 1957), knowledge of the different forms of leptospirosis has expanded considerably since World War II. In addition to leptospiral jaundice, disease phenomena in man, usually without jaundice, can be produced by *Leptospira canicola,* which seems to be primarily a disease of dogs; by *Leptospira pomona,* the cause of swineherd's disease, which has been recognized among swine, cattle, and horses, and occasionally in man; and by *Leptospira ballum, Leptospira bataviae, Leptospira pyrogenes,* and *Leptospira hebdomadis,* each of which has been implicated occasionally in human disease.

Of particular interest in this connection are developments in knowledge of Fort Bragg fever (p. 41). This disease, which was first recognized and described as a clinical entity by Daniels and Grennan (Daniels, W. B., and Grennan, H. A.: Pretibial Fever, an Obscure Disease. J.A.M.A. 122: 361–365, June 1943), occurred as an epidemic among soldiers at Fort Bragg, N.C., in 1943. Through the happy circumstances, compounded of good clinical and epidemiological practice, that acute and convalescent serums from many of these patients were collected and preserved and that infective material was maintained in animals, it was possible nearly 10 years later for Gochenour and coworkers (Gochenour, W. S., Jr., Smadel, J. E., Jackson, E. B., Evans, L. B., and Yager, R. H.: Leptospiral Etiology of Fort Bragg Fever. Pub. Health Rep. 67: 811–813, August 1952) to determine on the basis of serologic and bacteriological evidence that this disease was due to infection with *Leptospira autumnalis,* an organism which was not known to have occurred previously in the United States.

The U.S. Army reported a total of 452 admissions of spirochetal jaundice during World War I, with a resultant loss of 9,251 days and 15 deaths. Thirty-five of the admissions occurred among officers and were not reported by geographic area; of the 417 admissions among enlisted men, 279 occurred in the United States, 108 in Europe, and 30 elsewhere. To these original admissions must be added 80 instances in which the same malady occurred concurrently with other diseases, making a grand total of 532 cases.[2] The disease also occurred in the British, French, and German Armies on the Western Front during World War I.[3]

In World War II, viral hepatitis was endemic throughout the war and reached epidemic proportions at one time or another in several theaters. In addition, a great epidemic of homologous serum jaundice, which is also of viral origin, developed from the administration of yellow fever vaccine that contained small amounts of infective human serum; sporadic cases of homologous serum jaundice were also observed following transfusions of whole blood and blood plasma. While the relationship of infectious hepatitis to homologous serum jaundice is still unsettled, approximately 182,000 admissions for one or the other of the two diseases were recorded among military personnel during World War II. Suffice it to say that the widespread occurrence of these diseases, in which jaundice is an objective sign, created a vexing diagnostic problem with respect to the differentiation of Weil's disease.

Incidence.—The foregoing statements concerning the confusion existing in the differential diagnosis of cases in which fever and jaundice occur are emphasized by the circumstance that tabulations of the individual medical records for Army personnel from 1942 to 1945, inclusive, show a total of 8,167 cases of Weil's disease. For the year 1942 alone, 6,949 cases of Weil's disease were recorded on individual medical records.

Interpretation of these conflicting data must rest largely on collateral evidence, but, when all of this is reviewed, the conclusion is reached that the true incidence was relatively small. More than three-fourths of all the cases reported on the individual medical records were recorded for 1942. This was the year of the great epidemic of homologous serum jaundice from yellow fever vaccine; undoubtedly, before medical officers became aware of this virtually new clinical syndrome, Weil's disease was erroneously assigned as the tentative diagnosis in many instances. The most reliable statistics appear to be those for the year 1944–45, during which about 60 cases of Weil's disease were reported in the total Army; 10 in the continental United States, 20 in Europe, 5 in the China-Burma-India theater, and 25 in the Pacific. The Office of the Surgeon General has for many years recognized this overstatement in the medical records.

---

[2] The Medical Department of the United States Army in the World War. Washington: U.S. Government Printing Office, 1928, vol. IX, p. 483.

[3] Official History of the Great War Based on Official Documents. Medical Services. Diseases of the War. London: His Majesty's Stationery Office [1922], vol. I, p. 378.

It must be recalled that in civilian practice a substantial proportion of cases of leptospiral jaundice is probably overlooked, since at different times and places when the disease has been particularly sought for, an increased number of cases has usually been found.[4] It is probable, therefore, that the actual number of cases occurring among military personnel during World War II was approximately 200.

A few cases of leptospirosis were recognized among war dogs during World War II. A serologic survey for leptospirosis among 4,368 war dogs yielded positive results in 58 (1.3 percent) and questionable results in 136 (3.1 percent).[5] There is no record of transmission of leptospirosis from war dogs to military personnel.

Epidemiological features.—It is known that wild rats and mice, particularly the Norway rat (*Rattus norvegicus*), are a common carrier of *Lept. icterohaemorrhagiae*, which they eliminate in the urine; it is believed that these animal species are the principal natural reservoir of the infection. Among civilians, Weil's disease is encountered largely in individuals whose occupation brings them into contact with water that has been contaminated with rat urine. Thus, sewer workers, miners, fishmongers, and poultry dressers are groups with a relatively high risk of infection.

Military operations frequently create conditions which would appear to be particularly conducive to acquisition of this disease, and it is surprising that more authenticated cases of Weil's disease were not observed in World War II.

Of the 19 cases reported on the statistical health reports, 11 occurred in the European theater, 1 in the Africa-Middle East area, 6 in the Pacific, and 1 in the United States. Of the cases reported from the European theater, 4 occurred in 1944 and 7 in 1945. While few details are available concerning the circumstances of infection in these cases, scattered reports in the literature suggest that wet shellholes and sluggishly moving streams, both doubtless contaminated with rat urine, provided the most likely places of infection.[6] At least 39 cases occurred in the British Army in France, and 17 additional cases were reported from British forces in Italy.

---

[4] (1) Yager, R. H., and Gochenour, W. S., Jr.: Leptospirosis in North America. Am. J. Med. 1: 457–461, May 1952. (2) Havens, W. P., Bucher, C. J., and Reiman, H. A.: Leptospirosis: A Public Health Hazard; Report of a Small Outbreak of Weil's Disease in Bathers. J.A.M.A. 116: 289–291, January 1941. (3) Ward, T. G., and Turner, T. B.: Study of Certain Epidemiological Features of Leptospiral Jaundice in Baltimore. Am. J. Hyg. 35: 122–133, January 1942. (4) Beeson, P. B., and Hankey, D. D.: "Benign Aseptic Meningitis" as a Manifestation of Leptospiral Infection. Tr. A. Am. Physicians 63: 130–135, May 1950. (5) Gauld, R. L., Crouch, W. L., Kaminsky, A. L., Hullinghorst, R. L., Gochenour, W. S., Jr., and Yager, R. H.: Leptospiral Meningitis: Report of an Outbreak Among American Troops on Okinawa. J.A.M.A. 149: 228–231, May 1952.

[5] Miller, Everett B.: The Medical Department of the United States in World War II, Army Veterinary Service. [In preparation.]

[6] (1) Semiannual Report of Medical Services, European Theater of Operations, Chief Consultant in Medicine, 1 January–30 June 1945; Exhibit I, Anglo-American Consultants Conference Medical Programme, pp. 7–12. (2) Bulmer, E.: Weil's Disease in Normandy: Its Treatment With Penicillin. Brit. M.J. 1: 113–115, 27 Jan. 1945. (3) Hutchison, J. H., Pippard, J. S., Gleeson-White, M. H., and Sheehan, H. L.: Outbreak of Weil's Disease in the British Army in Italy. Trop. Dis. Bull. 43: 338, April 1946.

The extent of occurrence of other clinical syndromes due to *Leptospira* during World War II is difficult to determine, since in most of these jaundice is not a prominent feature and during the war diagnostic antigens for the other species of *Leptospira* were not available. The episode of Fort Bragg fever is discussed by Dr. Tatlock in part II of this chapter. Other outbreaks of mild disease may well have been due to unrecognized infection with one or another species of *Leptospira.*

Problems of diagnosis.—Despite the alternate designation of Weil's disease as leptospiral jaundice, jaundice occurs only late in the course of the disease and may not occur at all in about half the cases. Abrupt onset, fever, muscle pain, headache (often with meningismus), cutaneous and scleral hemorrhages, and albuminuria are common early symptoms, which makes the disease difficult to distinguish from many other acute infections, notably influenza. At times, meningeal symptoms are predominant.[7]

While the disease may therefore be suspected on clinical grounds, definitive diagnosis must be made on the basis of laboratory tests. These tests are isolation of the causative organisms from blood or urine, by inoculation of the young guinea pig or hamster and also by culture, and demonstration of specific antibody rise by the agglutination test. These are well-known procedures, but it is often not practicable to carry them out under field conditions, either because of the unavailability of young guinea pigs or hamsters or of living cultures of *Lept. icterohaemorrhagiae* for agglutination tests. A simpler laboratory test would greatly facilitate differential diagnosis. The importance of including antigenically different species of *Leptospira* in the diagnostic procedures has already been noted.

Attention should be directed to a frequent source of error in laboratory diagnosis. It is virtually never possible to demonstrate *Leptospira* in the blood of patients by microscopic examination, either in stained films or by dark field. Yet, over and over again, strands shed from red blood corpuscles have been mistakenly identified as *Leptospira* under the dark-field microscope; this happens repeatedly in civilian practice and was often a cause of confusion in military practice in World War II.

Typical of other episodes involving diagnostic confusion was the so-called Alaskan epidemic.[8] In February 1945, cases of jaundice began to occur at Whittier in the Alaskan Department; they reached epidemic proportions during March. Cases listed according to date of onset of symptoms were as follows:

Period:	*Number of cases*
Feb. 12–28	7
Mar. 1–10	56
Mar. 10–20	5

[7] See footnote 4 (4) and (5), p. 39.

[8] Letter, Office of the Surgeon, Alaskan Department, to Office of the Surgeon General, 15 Mar. 1946, subject: Medical History, Alaskan Dept. for the Year 1945.

The disease was characterized by sudden onset with nausea, epigastric distress, chilliness, backache, and mild generalized myalgia. Only an occasional patient had clinically recognizable jaundice, while in a few additional patients there was an elevated icterus index.

Because one of the first patients had jaundice, Weil's disease was suspected. *Leptospirae* were said to have been observed on dark-field examination of blood smears in this patient, and similar "organisms," which formed the basis of the diagnosis of Weil's disease, were observed in a total of 198 persons, of whom 68 had symptoms and 130 were not sick. The post was quarantined, and most of the sick persons were given either penicillin or Mapharsen (oxophenarsine hydrochloride).

Upon request of the Surgeon of the Alaskan Department to The Surgeon General, Capt. Sidney S. Gellis, MC, of the Army Epidemiological Board was dispatched to Alaska to investigate the outbreak. It was determined that the so-called *Leptospirae* were in fact pseudospirochetes arising from red blood cells, that no *Leptospirae* were recovered by animal inoculation, and, subsequently, that none of the patients had agglutinins for *Lept. icterohaemorrhagiae.*

While the nature of the outbreak was not conclusively determined, it was believed to have been one of infectious hepatitis.

Summary.—Leptospiral jaundice, or Weil's disease, was not an important cause of illness among military personnel during World War II. It presented, however, a diagnostic problem in the differentiation of other infectious diseases in which jaundice is a prominent feature, notably infectious hepatitis and homologous serum jaundice, both of viral origin. Simplification of laboratory methods for the diagnosis of leptospirosis would go far toward solving this problem of differential diagnosis.

Leptospirosis remains a potential problem in future military operations wherever personnel must come into contact with stagnant water likely to be contaminated with rat excreta. Field mice and other small mammals, as well as swine, cattle, horses, and dogs, are also natural or aberrant hosts of *Leptospira* and may, under special circumstances, serve as sources of infection for military personnel. The common modes of transmission of these species of *Leptospira* are not well known.

THOMAS B. TURNER, M.D.

Part II. Leptospiral Pretibial Fever (Fort Bragg Fever)

Among the new diseases first described during World War II was one designated Fort Bragg fever. It was originally thought to be due to a virus but was later shown to be caused by *Leptospira autumnalis.*[9] The investigation of this disease was accomplished by means of facilities and personnel

---

[9] Gochenour, W. S., Jr., Smadel, J. E., Jackson, E. B., Evans, LaR. B., and Yager, R. H.: Leptospiral Etiology of Fort Bragg Fever. Pub. Health Rep. 67: 811–813, August 1952.

559625v—61——5

furnished by the Preventive Medicine Service, Office of the Surgeon General. The research laboratory built, equipped, and maintained for the Commission on Respiratory Diseases at Fort Bragg did much to implement the difficult research. No immunologic relationships have been shown between the causative agents of Fort Bragg fever and of sandfly fever and dengue, which it somewhat resembled.

Incidence.—An outbreak of Fort Bragg fever occurred at Fort Bragg, N.C., during the summer of 1942. As the clinical characteristics became apparent during the course of the epidemic, attention was called to the description of an outbreak of a similar disease in Wrens, Ga., in 1940.[10] With this exception, nothing could be found in the professional literature to indicate that the disease had been recognized in the past. The outbreak was studied in detail from a clinical point of view by Lt. Col. (later Col.) Worth B. Daniels, MC, and Capt. H. Arthur Grennan, MC, who reported 40 cases between 29 July and 1 September 1942.[11] It seemed probable that the true incidence of the disease was considerably higher because many more individuals experienced similar illness without rash at a time when the seasonal incidence of respiratory tract disease, including influenza, was low. Similar outbreaks of an illness that was strongly suspected of being the same disease occurred at the same season during the next 2 years. It was noteworthy that the cases all occurred in the same area of the post.

Epidemiology.—Toward the end of the 1942 epidemic at Fort Bragg, The Surgeon General assigned a commission to study the disease. The members of the commission were Dr. Norman H. Topping, of the U.S. Public Health Service; Maj. (later Col.) Cornelius B. Philip, entomologist in the Sanitary Corps; and Dr. John R. Paul, School of Medicine, Yale University.

Data accumulated by this commission, in collaboration with Colonel Daniels and his staff, led to the belief that some local environmental factor, perhaps an insect vector, was responsible for the spread of the disease. All the cases came from the northern third of the reservation near a small stream and its tributaries. In the Wrens epidemic, known locally as Brushy Creek fever, all of the patients had gone swimming in a neighboring stream. Patients at Fort Bragg had not been swimming. Furthermore, no one insect found in the Fort Bragg area seemed to be a likely vector. Circumstantial evidence suggested that the incubation period of the disease was rather long, perhaps 10 days or longer, but no definite conclusion could be reached on this point. There was no evidence to suggest spread by personal contact, and isolation of cases was considered unnecessary. The commission concluded[12] that (1) a nonexanthematous form of the disease exists and (2) that, if all forms of the disease are considered, it can appear in explosive epidemic form so that within a period of 2 weeks almost 10 percent of the officers and men

---

[10] Bowdoin, C. D.: A New Disease Entity (?) J.M.A. Georgia, 31: 437–438, December 1942.

[11] Daniels, W. B., and Grennan, H. A.: Pretibial Fever, and Obscure Diseases. J.A.M.A., 122: 361–365, 5 June 1943.

[12] Topping, N. H., Philip, C. B., and Paul, J. R.: Report of the Commission for the Study of an Unidentified Disease at Fort Bragg, N.C., 3 Sept. 1942–11 Sept. 1942.

in a given company can be infected. No means of control was found, since the mode of transmission of the disease was unknown.

Clinical description.—The onset of the disease was usually sudden, with pronounced constitutional symptoms. The temperature curve was characteristically spiking, often with two or more peaks up to 103° or 104° F. in the course of 24 hours. The fever lasted about 5 days with rapid defervescence, and there was usually no recurrence. No complications were seen, and most of the soldiers affected were back on duty in about 10 days. Treatment was symptomatic.

Headache was a prominent symptom. In 3 cases with meningismus, spinal fluid findings were negative. Minor respiratory symptoms were seen in a third of the cases in the early stage of the disease. Splenomegaly appeared in most of the cases, but lymphadenopathy was not observed. The distinctive feature of the disease was the appearance of a rash confined to the pretibial area in 60 percent of the cases, with scattered lesions elsewhere on the body in an additional 20 percent of the cases. The lesions consisted of erythematous localized blushes with irregular borders, varying from 2 to 5 cm. in diameter. They felt warm, were slightly indurated, and were often tender to touch. Though the lesions were suggestive of erythema nodosum, they were less distinct. The rash generally lasted about 2 days and could not be ascribed to drug reaction or to insect bites. A leukopenia with normal differential count was usually seen. The diagnosis depended entirely on recognition of this clinical picture in conjunction with the epidemiological findings. Exclusion of other types of short fevers by appropriate means was obviously necessary. Bacteriological and serologic tests were found to be negative for a variety of diseases.

Etiology.[13]—The members of the special commission attempted to isolate the etiological agent of the disease from frozen specimens of blood, nasal washings, and urine from the few patients available during the time of their study and from flies and mosquitoes collected locally. They concluded "* * * all tests on this material proved negative insofar as isolating, or determining the nature of, the infectious agent responsible for this disease was concerned."

In August 1944, an unidentified nonbacterial agent was recovered from guinea pigs inoculated with freshly drawn blood from a soldier with Fort Bragg fever. Preliminary tests suggested that the agent was filterable. After prolonged passage of the probable virus in animals and eggs, inoculation of human volunteers with this virus reproduced the clinical picture of the disease with rash in some of the subjects. This was thought to constitute strong but not conclusive evidence that the etiological agent had been found. This work was carried out by the author, a member of the Commission on Acute Respiratory Diseases of the Army Epidemiological Board, which was resident as a group at Fort Bragg at the time. This commission, through another of

---

13 (1) See footnotes 1, p. 37; and 4, p. 39. (2) Tatlock, H.: Studies on a Virus From a Patient With Fort Bragg Fever (Pretibial Fever). J. Clin. Investigation 26: 287–297, March 1947.

its members, Dr. Albert B. Sabin, provided the subjects for and financed the human transmission experiments.

Preliminary tests to determine the biological characteristics of the etiological agents suggested that its infectivity was destroyed by the freezing and thawing of blood known to contain the agent. During the human transmission experiments in 1946, blood shown to be infectious when freshly drawn had lost its capacity to infect after only 10 days' storage at $-70°$ C. In 1942 and 1943, the members of the special commission had failed to transmit the disease to human subjects by use of frozen and thawed blood drawn from patients in the acute febrile stage. The liability of the virus to freezing was thought by the author to be a probable explanation for the failure of the first set of human transmission experiments. In tests on the appearance of the agent in the blood of the human volunteers, it was found that the infectious stage occurred shortly before the onset of fever and disappeared promptly; furthermore, the titer of the agent in the human blood was very low, a 1 to 10 dilution being ineffective where undiluted blood or serum killed hamsters. No attempts were made to detect the agent in other human tissues or secretions.

From cross-immunity tests in human beings, the new agent was shown to have neither a group relationship with the known dengue viruses nor any relationship with one strain of sandfly-fever virus. It appeared to be unrelated in its serologic and other properties to the agents of lymphocytic choriomeningitis, Q fever, and Rocky Mountain spotted fever. Details concerning the properties of the agent and the cross-immunity test may be found in the author's article.[14]

Summary.—It is evident that Fort Bragg fever presented no considerable military problem during the war; it occurred in a localized area of one large Army post in the Southern United States. There was nothing to indicate a potentially high degree of infectivity or a rapid rate of spread of the disease, though circumstantial evidence suggested that 10 percent of a population might become infected. Recognition of the disease was based solely on clinical and epidemiological considerations, there being no serologic or other specific test to confirm the diagnosis. The course of the disease was benign, and soldiers were disabled by it for a period of only a week or 10 days, at the end of which time they returned to full duty. There were no special problems in the management of cases. No means of control was found, since the mode of transmission could not be established. Apparently, a hitherto undescribed agent was isolated from the blood of a soldier with the disease. Finally, it was shown by Gochenour[15] and others in 1952 that the etiological agent was *Leptospira autumnalis*.

HUGH TATLOCK, M.D.

---

14 See footnote 13(2), p. 43.

15 See footnote 1, p. 37.

CHAPTER VI

Schistosomiasis

Malcolm S. Ferguson, Ph. D., and Frederik B. Bang, M.D.

The first human schistosome was discovered by Bilharz in Cairo, Egypt, in 1851. Later it was found that *Schistosoma haematobium* was the cause of hematuria, then a common condition in the fellaheen population. Schistosomiasis, however, is an ancient disease; eggs of *S. haematobium* have been found in mummies dating back to 1250 B.C. During the Middle Ages, hematuria was described by Arabian physicians, but it is not certain that they referred to the type endemic in Egypt. That an endemic disease was related to hematuria in the Nile Valley was first mentioned in 1808. In 1847, the oriental type of schistosomiasis was recognized by Fujii as being endemic in Japan; this was a half century before the discovery of *Schistosoma japonicum* by Fujinami and Katsurada. The third human blood fluke, *Schistosoma mansoni*, was finally differentiated from *S. haematobium* in 1915, but it is of interest to note that Bilharz had described its lateral-spined eggs more than 70 years earlier.

Although schistosomiasis resulting from infestation with *S. haematobium* is an ancient disease and presumably has affected soldiers for centuries in times of both war and peace, it was not until the 18th century that the disease manifested its military importance. During Napoleon's Egyptian campaigns between 1799 and 1801, his troops suffered severely from hematuria. A century later, British and Australian troops acquired schistosomiasis during the Boer War. The British list more than 300 cases from this campaign; during the period from 1901 to 1911, more than 600 infections were diagnosed in troops who had served in endemic areas of South Africa. An outbreak of schistosomiasis occurred in Egypt among British garrison troops in 1912. During World War I, only a few dozen British troops acquired the disease in Egypt and Mesopotamia, but service in the Middle East during this period accounted for 157 recognized cases among Australian soldiers. After the war, in 1921, 31 men of a British garrison became infected while they were camped along the Euphrates River in Mesopotamia. Only five cases of schistosomiasis were listed as having been acquired by Italian troops during the Ethiopian campaign in 1935.

The Germans were aware of the problem of schistosomiasis in north Africa. From 1940 to 1942, while their troops were in that area, they studied methods of preventing the infection. A few cases of the disease occurred

among German prisoners of war who had become infected in the Sweet Water Canal. The most extensive experience of the British with the disease during World War II was in the West African Force in which 432 British and 1,279 African troops developed clinical symptoms after exposure in a lagoon in southern Nigeria immediately before they were transported to India.

Elsewhere, during World War II, British troops acquired a few infections. There were 42 cases among soldiers in the Middle East and 2 cases in the British North African Force. In Africa and the Middle East, Australian troops contracted very few infections. During the liberation of the Philippines in 1944, however, 144 men developed schistosomiasis japonica.

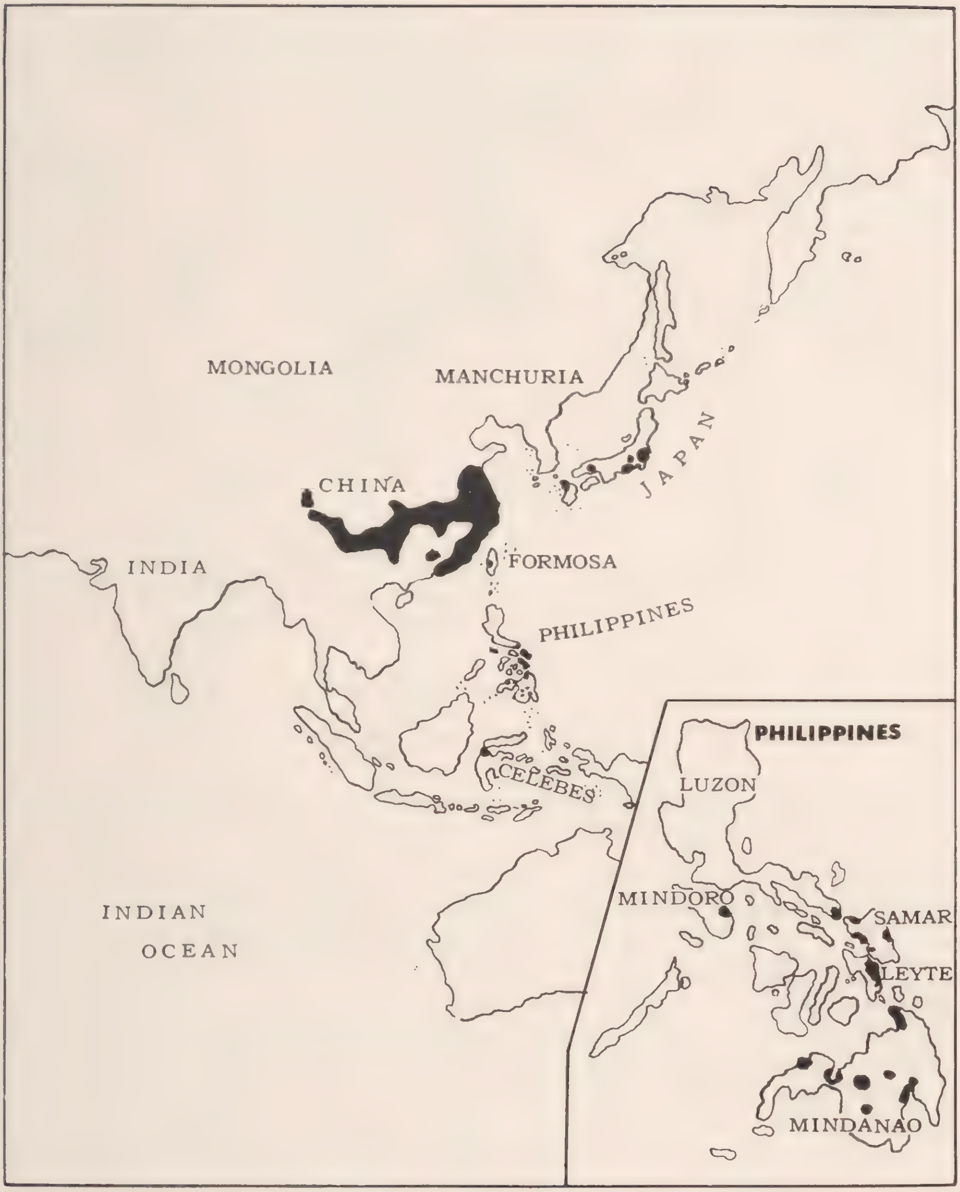
Experience of U.S. military personnel with schistosome infections before World War II was negligible, having been confined to a few cases among naval personnel from ships stationed in Chinese inland waters and among Puerto Rican members of U.S. Armed Forces. Early in World War II, the Preventive Medicine Service of the Surgeon General's Office and civilian scientists recognized that U.S. troops would probably be called upon to operate in areas where human schistosomes were endemic. Publications disseminated information concerning the three schistosome infections (their distribution, etiology, epidemiology, diagnosis, treatment, and prevention) and speculated on the likelihood that some U.S. troops would become infected, either during battle operations or while off duty. As late as July 1944, in spite of warnings by the Preventive Medicine Service,[1] certain line officers considered schistosomiasis to be a disease of nonmilitary importance in the Philippines and one likely to affect only a small number of troops. The first operation for the liberation of the Philippines (later in 1944) resulted in the exposure on Leyte of thousands of U.S. troops to the infective stage of *S. japonicum*. All three species of human blood flukes were encountered during the period from 1941 to 1945, but, fortunately, only oriental schistosomiasis proved to be of military importance.

Geographic distribution of human schistosomes.—According to the estimates of Stoll, there may be as many as 114 million human schistosome infections throughout the world.[2] *S. japonicum* occurs in vast areas of China, in five small foci in Japan, in several islands of the Philippines, in Formosa, and in one known region of the Celebes (map 1). The strain which occurs in Formosa apparently is not well adapted to man. *S. haematobium* and *S. mansoni* overlap somewhat in distribution, but infestation with the latter is much more widespread. *S. mansoni* occurs in Africa, principally in a band across the central region of the continent; in Madagascar; in South America, in Brazil, Surinam, and Venezuela; and in some of the islands of the West Indies, especially Puerto Rico (map 2). *S. haematobium* occurs more extensively in Africa than does *S. mansoni*. *S. haematobium* is present

---

[1] War Department Technical Bulletin (TB MED) 68, 18 July 1944.

[2] Stoll, N. R.: This Wormy World. J. Parasitol. 33: 1–18, February 1947.



MAP 1.—Geographic distribution of *Schistosoma japonicum.*

throughout the continent of Africa and in Madagascar, as well as in southern Portugal and in Israel, Iran, Iraq, Syria, Saudi Arabia, and Yemen.

Life cycle of human schistosomes.—The adults of *S. haematobium*, *S. mansoni*, and *S. japonicum* all live in the blood vessels and there deposit large number of eggs which reach the outside of the body either in urine

MAP 2.—Geographic distribution of *Schistosoma haematobium and Schistosoma mansoni.*

or feces. *S. haematobium* inhabits principally the vesical and pelvic venous plexuses, and eggs deposited in the blood vessels of the bladder escape into the lumen and are eliminated in the urine. If worms are present in the rectal venules, eggs may also be found in the feces. Both *S. mansoni* and *S. japonicum* live usually in the mesenteric veins, and eggs deposited in large numbers in the veins of the wall of the small and large intestine leave the body in the feces.

The life cycles of the three human schistosomes are similar and are not complicated trematode life histories, since only two hosts are required—man, or certain other mammals, and a few species of fresh-water snails (fig. 3). However, maintenance of the cycles depends largely on the sanitary practices of man with regard to the disposal of his body wastes. For survival and development of the parasite, urine or feces containing eggs must reach fresh water shortly after leaving the body. There, the larvae (miracidia) hatch almost immediately from the eggs and invade the appropriate species of snail if it happens to be present. Within the snail host, the miracidium develops into a mother sporocyst which gives rise to large numbers of daughter sporocysts, each of which may produce thousands of fork-tailed larvae called cercariae. These cercariae escape from the snail and can swim actively in water. One infected snail may release large numbers of cercariae over

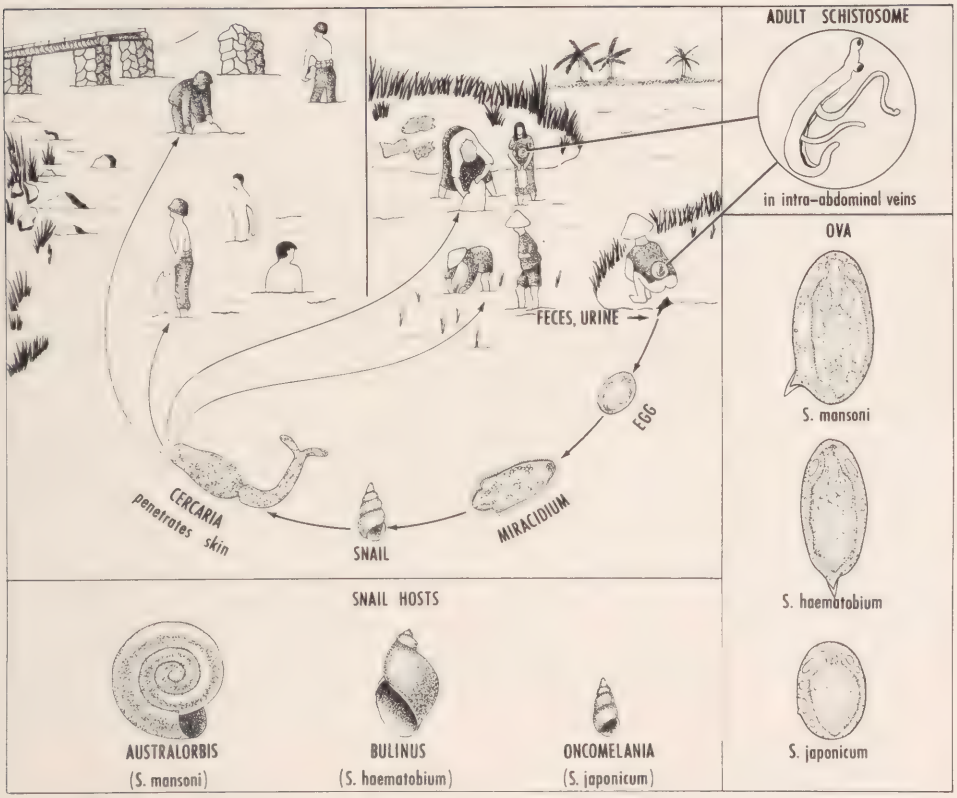


FIGURE 3.—The epidemiology of schistosomiasis and the infection of military personnel.

many weeks. Capable of living in water for a day or two, the cercariae are infective for man and can penetrate the skin on contact. The cercariae lose their tails during penetration, invade the blood vessels, follow a migration route in the body, and eventually reach the veins (mesenteric, vesical, or pelvic) in which they grow into either male or female blood flukes ranging in length from 10 to 25 mm., depending on the sex and species. The females of *S. mansoni* and *S. japonicum* lay their eggs in the venules of either the small or large intestine; *S. haematobium* deposits its eggs in the bladder.

ACTIVITIES IN ZONE OF INTERIOR

The Army was concerned with human schistosomes both within the Zone of Interior and in oversea areas. During the period 1942 to 1945, inclusive, there were recorded approximately 2,500 cases of schistosomiasis (table 8). Activities in the United States consisted of conducting certain laboratory studies, of publishing and disseminating information concerning schistosomiasis, and of taking precautions against the introduction of schistosomiasis into this country by returning servicemen who were infected.

559625v -61— 6

Outside the continental limits of the United States, the Army was concerned primarily with the prevention of schistosome infection in troops operating in endemic areas. Field and laboratory investigations of the schistosomiasis problems were also carried on in endemic areas.

TABLE 8.—*Incidence of schistosomiasis in the U.S. Army, by theater or area and year, 1942–45*

[Preliminary data based on sample tabulations of individual medical records]
[Rate expressed as number of cases per annum per 1,000 average strength]

Area	1942–45		1942		1943		1944		1945	
	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate
Continental United States	194	0.01		0	8	0	11	0	175	0.06
Overseas:										
North America [1]										
Latin America	633	1.66	29	.28	79	.65	235	2.74	290	3.98
Europe	5	.00							5	.00
Mediterranean [2]	22	.01			1	.00	16	.02	5	.01
Middle East										
China-Burma-India	19	.04			1	.03	13	.08	5	.02
Pacific Ocean Area	116	.09	1	.01	1	.00	4	.01	110	.29
Southwest Pacific	1,545	.84	1	.01			84	.16	1,460	1.41
Total overseas [3]	2,350	.22	31	.05	82	.05	352	.09	1,885	.41
Total Army	2,544	.10	31	.01	90	.01	363	.05	2,060	.27

[1] Includes Alaska and Iceland.
[2] Includes North Africa.
[3] Includes 10 admissions on transports in 1945.

Educational Measures

The Preventive Medicine Service of the Office of the Surgeon General prepared a number of publications on the prevention and control of schistosomiasis for use by military personnel both in the United States and overseas. On 9 June 1941, The Surgeon General issued Circular Letter No. 56, in which the etiology, distribution, treatment, and prevention of schistosomiasis resulting from infestation with *S. mansoni* were discussed. This letter was intended for use in the Caribbean Defense Command. As yet, the United States was not at war with Germany or Japan. In February 1943, another circular letter dealing with all three types of schistosomiasis appeared. This material had been compiled after consultation with the Subcommittee on Tropical Diseases, Division of Medical Sciences, National Research Council, and with experts of the Navy and of the National Institute of Health, U.S. Public Health Service. Subsequently, during the period April 1944 to April 1946, inclusive, medical and sanitary data concerning Formosa, the Philippine Islands, Japan, southeastern China, and northeastern China, in all of which schistosomiasis occurred, were published in TB MED's (War

Department Technical Bulletins) 30, 68, 160, 171, and 220, respectively. It should be noted that in these publications schistosomiasis japonica was considered to be of potential military importance in China and Japan, whereas, in the Philippines, the disease was considered a serious one but of nonmilitary importance and likely to affect only small numbers of troops. Eventual experience in the Philippines showed that the dangers to troops had not been correctly appraised. Whether schistosomiasis japonica would have been a serious military problem in China or Japan is a matter of speculation.

After the appearance of hundreds of cases of schistosomiasis japonica in troops on Leyte, Philippine Islands, early in 1945, TB MED 167, a rather comprehensive discussion of this disease, was published in June 1945. This publication placed particular emphasis on the life history of the parasite and on the diagnosis, treatment, and prevention of the disease.

Early in 1945, the Preventive Medicine Service arranged that two motion pictures on schistosomiasis japonica be made in the United States, primarily from footage acquired in the Philippines. One production, a short training film on *S. japonicum*, was to be used for the indoctrination of troops scheduled to invade Japan. This film was not completed until October 1945, more than a month after the end of the war in the Pacific. The second production, a professional technical version in color for the instruction of personnel of the Medical Department, was begun in April 1945 but was not released until after the end of the war.

Sanitary Precautions

About the middle of 1945, the policy of the Army was to concentrate at two tropical disease centers, Harmon General Hospital, Longview, Tex., and Moore General Hospital, Swannanoa, N.C., soldiers who had been returned to the United States after being treated for schistosomiasis japonica overseas. At first, both the Army and the U.S. Public Health Service were concerned[3] about the possibility that raw sewage from these hospitals flowing into streams might create a hazard if viable schistosome eggs were being discharged and suitable snail hosts of *S. japonicum* were present in these waters. No precautions were taken at Harmon General Hospital because the sewage flowed into brackish water, but at Moore General Hospital the raw sewage was chlorinated for a few weeks.[4]

In August 1945, the chlorination procedure was discontinued by the Corps of Engineers because it was believed chlorination could not be relied upon to kill viable eggs or miracidia and because no suitable snail host for *S. japonicum* had been shown to exist in the particular areas in question. History would appear to support this action, since no species of schistosome

---

[3] Letter, Thomas Parran, Surgeon General, U.S. Public Health Service, to Gen. Norman T. Kirk, The Surgeon General, U.S. Army, 11 Aug. 1945.

[4] Memorandum, Col. W. A. Hardenbergh, SnC, Director, Sanitary Engineering Division, Office of the Surgeon General, for Maj. Choice B. Matthews, 18 Aug. 1945, subject: Sewage Treatment at Moore and Harmon General Hospitals.

of man has ever become established in this country in spite of the facts that presumably thousands of people from Africa, China, the Philippines, and Japan who were infected with schistosomes have come to this country and that the conditions under which these people have lived in this country would not meet present-day sanitary standards.

Van Cleave[5] was apprehensive that returning servicemen might be responsible for the establishment of human blood flukes in the United States. On the other hand, Stoll[6] did not regard the introduction of schistosomes after World War II as a public health threat. He cites Peltier who, in 1929, noted that no autochthonous case of schistosomiasis had been known to occur in France, although infected soldiers had been entering that country for more than 100 years. Failure of the disease to become established there may be due to the lack of a suitable molluscan host. Brumpt and other French workers have exposed a large number of species of snails to schistosome miracidia without finding any that were susceptible. Returning soldiers were reported to have been responsible for the establishment of a limited, and now extinct, focus of infection in western Australia after the Boer War.[7] However, because a snail host was never identified and the laboratory diagnosis may have been in error, Fairley suspects that an area of endemicity may never have existed in Australia.[8] More recently in India, experiments with snails by two groups of investigators failed to demonstrate a species that would become infected with *S. haematobium* or *S. mansoni* derived from African troops stationed in that country.[9]

A note of caution should be added here, however, since it was found in 1945 that, under certain laboratory conditions, cercariae of *S. mansoni* develop in the American snail, *Tropicorbis havanensis*. Similarly, it was determined that *S. japonicum* develops in the laboratory in the American snail *Pomatiopsis lapidaria*.[10] The field significance of these findings has yet to be demonstrated.

---

[5] (1) Van Cleave, H. J.: Some Influences of Global War Upon Problems of Disease. J. Am. Dietet. A. 21: 513–515, September–October 1945. (2) Van Cleave, H. J.: Returning Service Men, A Problem in National Health. Am. Sci. 32: 243–253, January 1944.

[6] Stoll, N. R.: Changed Viewpoints on Helminthic Disease; World War I vs. World War II. Ann. New York Acad. Sc. 44: 207–224, 30 Sept. 1943.

[7] Official History of the Australian Army Medical Services, 1914–18. Vol. 1, Melbourne: H. J. Green, Government Printer, 1930, p. 776. Vol. 3, Sidney: Halstead Press Pty. Ltd., 1943, pp. 266–267.

[8] Letter, N. Hamilton Fairley, Hospital for Tropical Diseases, London, to Dr. M. S. Ferguson, U.S. Public Health Service, 27 May 1952, subject: Bilharzia Disease.

[9] Mukerji, A. K., Bhaduri, N. V., and Narain, S.: Experiments on the Transmission of Human Schistosomiasis in India. Indian J.M. Research 34: 311–315, October 1946.

[10] (1) Cram, E. B., Jones, M. F., and Wright, W. H.: A Potential Intermediate Host of *Schistosoma mansoni*. Science 101: 302, March 1945. (2) Cram, E. B., Files, V. S., and Jones, M. F.: Experimental Molluscan Infection With *Schistosoma mansoni* and *Schistosoma haematobium*, Experiments With *Schistosoma mansoni*. *In* Nat. Inst. Health Bull. No. 189, January 1947, pp. 81–94. (3) Ward, P. A., Travis, D., and Rue, R. E.: Experimental Molluscan Infection With *Schistosoma japonicum*: Preliminary Small-Scale Experiments With Native Amnicolids During 1945. *In* Nat. Inst. Health Bull. No. 189, January 1947, pp. 95–100. (4) Berry, E. G., and Rue, R. E.: *Pomatiopsis lapidaria* (Say), an American Intermediate Host for *Schistosoma japonicum*. J. Parasitol. 34 (Supp.): 15, December 1948.

Investigations

Numerous projects pertaining to schistosome problems were initiated in this country by the Preventive Medicine Service, particularly in the period 1943–45. During the war, these studies were classified, and observations resulting from them were circulated only among civilian schistosomiasis investigators, Army, Navy, and U.S. Public Health Service personnel, and other responsible individuals. The bulk of the research work was carried on by personnel at universities under contracts with the Office of Scientific Research and Development; the Naval Medical Research Institute; and the National Institute of Health, U.S. Public Health Service, which conducted extensive investigational programs. The Preventive Medicine Service had proposed many of these projects, and certain studies on schistosomes were conducted in Army medical laboratories. Contributions from Army installations resulted mainly from investigations on the preparation and testing of antigenic materials and on the detection of schistosome ova in feces. The latter research yielded several techniques of definite value in diagnosing schistosome infections.

Studies at centers other than those of the Army were concerned with—

1. A search for possible snail hosts of human schistosomes in the United States.
2. Research on the development of the schistosomes in experimental mammalian hosts.
3. The cercaricidal effects of water-treatment processes.
4. The effects of sewage treatment on schistosome ova.
5. The protective value of untreated and chemically treated cloth fabrics.
6. Repellent ointments to protect the skin from cercariae.
7. Intradermal and serologic tests to determine infection.
8. The chemotherapy of schistosomiasis.

In these investigations, the Army contributed information and advice from those members of the Medical Department who had had experience with schistosomiasis. It also supplied materials for the experiments and a continuous supply of live snails collected in the Far East.

Investigations with *S. mansoni*, particularly at the National Institute of Health, began in May 1943, when an infected monkey was imported from Puerto Rico. Two months earlier, eggs of the molluscan host in Puerto Rico had been received and used in establishing colonies of *Australorbis glabratus* in the United States. Tests of the susceptibility of American snails to infection with *S. haematobium* became possible when a baboon that had been infected in Egypt was received at New York University on 7 July 1944. The infected baboon had been brought to this country from Egypt by Dr. Claude H. Barlow, who had exposed himself a few weeks before to cercariae of *S. haematobium*. Dr. Barlow proposed to go about the United States with a trailer and use the ova being excreted in his urine to determine whether any native species of snails would become infected with this parasite in its natural habitat. It was thought that a human infection would give more

conclusive results than an infection in lower animals because man apparently is the only natural host in endemic areas and also because of the possibility that passage through laboratory animals might produce biological changes which would alter the susceptibility of snails to infection. It did not prove feasible for Barlow to use his infection for field studies in the United States.

As early as 3 April 1944, the U.S. Public Health Service requested that the Medical Department of the Army attempt to import into the United States from China live specimens of the molluscan host of *S. japonicum*.[11] Considerable effort was put into the project, but no Chinese snails were received in this country. It was not until 23 January 1945, some months after the invasion of Leyte, that dogs and live specimens of the snail host *Oncomelania quadrasi*, infected with *S. japonicum*, were received from the Philippines. Subsequently, when infected snails were collected by Army personnel and forwarded regularly from Leyte to the National Institute of Health, it was possible to initiate experimental work with the cercariae and adults of the oriental schistosome.

It should be mentioned at this point that the Preventive Medicine Service of the Office of the Surgeon General decided early in 1945 that it would be desirable for a group of specialists on schistosomes to go to the Philippines to undertake the study of a number of militarily pertinent problems concerning schistosomiasis japonica.[12] This project was approved by the theater commander, and in April 1945 a Subcommission on Schistosomiasis of the Commission on Tropical Diseases, Army Epidemiological Board, arrived on Leyte.

EXPERIENCE IN OVERSEA THEATERS

The bulk of the U.S. Army's experience with schistosomiasis and with the causative agents of the disease was in the Orient during 1944 and 1945. Before this, however, infection with both *S. haematobium* and *S. mansoni* had been encountered to a limited extent in U.S. troops in other theaters. As nearly as can be determined, no investigational work on *S. haematobium* was conducted by the Army during the war. On the other hand, several important studies on methods of diagnosing infections due to *S. mansoni* were initiated in Puerto Rico.

Schistosoma haematobium

During the North African campaign (Operation TORCH), which was begun in November 1942, U.S. troops came into the only region in which they encountered *S. haematobium*. Although troops were stationed in countries of Asia Minor where the parasite occurs, there were no known cases of infection. It may be significant to note here that Asia Minor was not a

[11] Letter, R. E. Dyer, Director, National Institute of Health, to Brig. Gen. S. Bayne-Jones, Office of the Surgeon General, 31 Mar. 1944.

[12] Annual Report, Commission on Tropical Diseases, Army Epidemiological Board, 19 Apr. 1945–19 Apr. 1946.

combat area for U.S. soldiers. Since the disease occurs all across northern Africa from Morocco to Egypt, in both coastal areas and oases, it is surprising that so few cases of infection occurred during the fighting in Tunisia. The low incidence of infection with this parasite cannot be attributed to a special educational program regarding schistosomiasis or to supervisory efforts of medical personnel. Need for avoiding contact with untreated fresh water in endemic areas was stressed in an article in the *Medical Bulletin of the North African Theater of Operations*, May 1944, but schistosomiasis was not considered to be an important communicable disease.

Only about 22 cases of infection with *S. haematobium* were recorded for the U.S. Army in the Mediterranean theater; exposure data are available for 17 of these. During July 1943, 14 men from a U.S. Army Air Corps service squadron bathed in a fresh-water pool close to Gafsa, Tunisia. Subsequently, after repeated urine examinations, three of these soldiers were proved to be infected with *S. haematobium*. The infections were apparently light, since the men were asymptomatic.[13] Also in July 1943, another group of U.S. Army Air Corps personnel swam in a fresh-water pond 5 miles east of Gafsa, Tunisia. These men had become separated from a convoy traveling from Oran, Algeria, and spent several days crossing the desert. With no medical officer to warn them, and understandably in the mood for contact with water, 35 of the 60 men went swimming. Of these 35 soldiers, 12 were later proved to have acquired schistosomiasis. The majority of the men developed clinical symptoms of the disease, only two being asymptomatic.[14] The only other available records of the disease refer to two soldiers who developed hematuria after exposure to cercariae in the fall of 1943, one while bathing in a watering trough near Mateur, Tunisia, and the other while swimming in a river flowing through Mateur.[15]

No schistosome infections were acquired in the China-Burma-India theater. The small number of cases reported for this area were in men who had become infected with *S. haematobium* in north Africa or with *S. mansoni* in Puerto Rico.[16]

Schistosoma mansoni

Infection in troops.—The known distribution of *S. mansoni* is in areas of the world where the troops of the United States were not required to fight. It does not occur to any extent in north Africa and, therefore, was not encountered during Operation TORCH. Regulations were issued concerning contact with fresh water in Puerto Rico, but there was a disregard for them, and maneuvers were even held in endemic areas. However, only one U.S.

---

13 Letter, Surgeon, North African Theater of Operations, to Surgeon, 557th Service Squadron, 43d Service Group, 7 Aug. 1944, subject: Cases of *Schistosoma haematobium*.

14 Letter, Surgeon, U.S. Forces, India-Burma Theater of Operations, 11 Jan. 1945, subject: Reported Case of Schistosomiasis (enclosure I).

15 Essential Technical Medical Data, Headquarters, North African Theater of Operations, U.S. Army, for April 1944.

16 Blumgart, H. L., and Pike, G. M.: A History of Internal Medicine in the India-Burma Theater of Operations, 1945, p. 140. [Official record.]

soldier is recorded as having acquired the disease. This man became infected in Puerto Rico in 1943, about 2 months after reaching the island. No information is available regarding his method of exposure. On the other hand, medical officers of the Army did encounter a considerable number of cases of infestation with *S. mansoni* in Puerto Rican soldiers who were infected before being inducted into the service. Cases of the disease in Puerto Ricans within the United States and in oversea areas were also discovered during the war; for example, 55 men in an antiaircraft gun battalion stationed in California in 1945 were found to be infected. Medical records indicate that about 850 infections due to *S. mansoni* were diagnosed.

Before April 1943, Puerto Ricans were taken into the Army without any screening for schistosome infection. After that date, however, a man otherwise physically and mentally fit was rejected if he was found, on the basis of one stool specimen, to be passing eggs of *S. mansoni*. This screening led to the rejection of from 9 to 14 percent of the Selective Service registrants each month.[17] There is evidence from autopsy records, skin tests, and repeated stool examinations that approximately 40 percent of the men in one group of Puerto Rican soldiers on duty in the Canal Zone were infected with *S. mansoni*.[18] It should be pointed out that many of the troops in the Canal Zone had been inducted before the screening process for schistosome infections was inaugurated. Even so, it was estimated that about 10 percent of the infected men were missed by the screening process. This was possible because most of those eventually found to be infected were asymptomatic. The large number of infected troops led to a consideration of the possibility that schistosomiasis might be endemic in the Canal Zone and in the Republic of Panama, since an infantry regiment of Puerto Ricans had been stationed at Empire, Canal Zone, during and following World War I. No screening of these troops for schistosome infection had been done, and the men had bathed in natural fresh water in both the Canal Zone and the Republic of Panama. In 1943, with the arrival in the Canal Zone of known infected Puerto Rican soldiers, the question of the health hazard of *S. mansoni* was raised. Since there was no indication that the parasite had been introduced by Puerto Ricans during or after World War I, since *Australorbis glabratus*, the molluscan host of *S. mansoni* in the New World, has not been found in the Canal Zone, and since studies at the School of Tropical Medicine, San Juan, P.R., failed to show that any of several species of snails collected in the Canal Zone would become infected with *S. mansoni*, it was concluded that there was at that time no danger of the introduction of the disease.

Puerto Rican soldiers infected with *S. mansoni* were stationed in other areas of the Antilles Department, including Saint Lucia and Trinidad, Brit-

---

[17] Annual Report, Surgeon, Antilles Department, 1944.

[18] (1) Professional History of Preventive Medicine in World War II, 1 January 1940 to 1 October 1945, The Panama Canal Department, vol. I., pp. 120–121. [Official record.] (2) Weller, T. H., and Dammin, G. J.: The Incidence and Distribution of *Schistosoma mansoni* and Other Helminths in Puerto Rico. Puerto Rico J. Pub. Health & Trop. Med. 21: 125–147, December 1945.

ish West Indies, and Curaçao, Netherlands West Indies. The disease is endemic in Saint Lucia, but the only cases encountered in military personnel were in native-born Puerto Ricans.[19]

Air Corps personnel were stationed in Brazil, where schistosomiasis is widespread, but no cases of the disease in these men were reported. The presence of the disease there and means of avoiding it were stressed in directives.[20]

Investigations.—Medical personnel in the Caribbean Defense Command (Antilles Department, including Puerto Rico, and Panama Canal Department) conducted a series of investigations on the occurrence and diagnosis of schistosomiasis, both independently and in collaboration with the School of Tropical Medicine, San Juan, P.R.

Personnel at the Antilles Department Medical Laboratory[21] made a study of the prevalence and distribution of *S. mansoni* in Puerto Rico. On the basis of only one stool examination, 1,909, or 9.9 percent, of 19,139 Puerto Rican Selective Service registrants were shown to be infected with *S. mansoni*. These records also pointed up several new foci of the disease on the island. The infection was found to be almost twice as prevalent among craftsmen as among farm laborers.

In August 1944, antigen prepared from cercariae and adults of *S. mansoni* at the School of Tropical Medicine, San Juan, was used to skin test 1,000 Puerto Rican troops in the Panama Canal Department.[22] Following this trial, it was proposed that the skin test be used on a larger scale, and in November all otherwise physically qualified selectees were skin tested at the Induction Station, Fort Buchanan, P.R. The program was purely investigative in character, and a positive reaction was not to be the basis for rejection for military service. The results of these studies were not conclusive because of difficulties with the sterility of the antigen and because many skin-test-negative individuals were found to have stools positive for *S. mansoni*.

Further research on diagnostic methods conducted by the Army consisted of a study of the acid-ether centrifugation and zinc sulfate flotation techniques as methods for the recovery of eggs of *S. mansoni*. In spite of inherent disadvantages, the acid-ether technique was found to be superior to the zinc sulfate flotation method.[23] A rectal scraper, another possible aid to the recovery of schistosome ova from infected persons, was developed and tested by the Army Medical Laboratory in San Juan.

---

[19] History of Medical Department Activities, Antilles Department, Preventive Medicine, pp. 61–65. [Official record.]

[20] Essential Technical Medical Data, U.S. Army Forces, South Atlantic, for January 1944. Enclosure 2 thereto.

[21] See footnote 18(2), p. 56.

[22] See footnote 17, p. 56.

[23] (1) Weller, T. H., and Dammin, G. J.: The Acid-Ether Centrifugation and the Zinc Sulfate Flotation Techniques as Methods for the Recovery of the Eggs of *Schistosoma mansoni*. Am. J. Trop. Med. 25: 367–374, July 1945. (2) Weller, T. H., and Dammin, G. J.: An Improved Method of Examination of Feces for the Diagnosis of Intestinal Schistosomiasis. Am. J. Clin. Path. 15: 496–500, November 1945.

Schistosoma japonicum

The Army's principal contact with blood-fluke disease occurred during the liberation of the Philippines. Troops were exposed to the larvae of *S. japonicum* on Leyte from October 1944 on into the early months of 1945. The subsequent outbreak of schistosomiasis was the signal for a more rigid enforcement of regulations regarding contact with fresh water and the invoking of other preventive measures, including a more intensive educational program. At the same time, U.S. medical personnel were afforded a unique opportunity to study the clinical aspects of this unfamiliar disease and to determine the value of therapeutic drugs in a large group of men who could be kept under close supervision for an extended period of time. The outbreak also provided additional incentive to those who had been working on laboratory and field aspects of the human schistosome problem in Leyte and led to the eventual development of three separate investigational programs on the island.

In retrospect, it must be recognized that on Leyte certain factors other than the preventive activities conducted by the Army were important in limiting the number of cases of the disease. First, the fighting had moved out of the endemic areas on the island before the first case of schistosomiasis was diagnosed late in December 1944, and, once an area was secured, camp sanitation practices such as the erection of showers using well water, eliminated most of the chance for exposure to water infested with cercariae. Combat activities involving contact with infested water were likewise over, since organized Japanese resistance had ended by late December. When soldiers began to come down with the disease, exhaustive inquiries were made to identify the waters in which they had been exposed. It became apparent that swamps, small streams, even fairly large rivers—in fact, all surface fresh water—should be avoided for swimming and for the washing of clothing and vehicles. The numerous laboratory and field investigations carried out were productive as sources of valuable information, but they contributed little to the actual control of schistosomiasis on Leyte.

In addition to the troops who acquired schistosome infections during the liberation of Leyte, about 30 percent of the U.S. prisoners of war who survived internment at the Davao Penal Colony on Mindanao, Philippine Islands, were infected with *S. japonicum.* The circumstances responsible for the exposure of these prisoners of war were different from those under which the troops became infected on Leyte and will be discussed separately.

Endemicity in the Philippines

In 1906, the first pathological observations of schistosomiasis japonica in the Philippines were reported, with the prediction that the disease would be found to be endemic in the islands. By 1941, nearly 30 papers reporting on

this disease had appeared, and it was then known that *S. japonicum* infected people on Leyte, Samar, Mindoro, and Mindanao. Later, it was determined that schistosomiasis is endemic in southeastern Luzon.[24]

Schistosomiasis japonica among prisoners of war

At the Army Medical Department Professional Service School, Washington, D.C., late in 1945, five of the released U.S. prisoners of war who had been interned for many months at the Davao Penal Colony in southern Mindanao were found by members of the Department of Parasitology to be infected with *S. japonicum*.[25] Because of the high mortality among prisoners of the Japanese, the approximate number of men who contracted schistosomiasis near Davao will never be known.

Exposure to infested water probably occurred in most cases while the prisoners were working in labor details in the Mactan ricefields a short distance from the penal colony. Schistosomiasis was apparently not diagnosed in any of the prisoners before their release in 1945, but many of the prisoners, while interned, suffered from a syndrome called "Dapeco fever," the cause of which was not known. Many of the symptoms associated with this syndrome resemble those of schistosomiasis; for example, fever, eosinophilia, urticaria, and gastrointestinal disturbances. It is of interest to note that some of the Japanese guards also suffered from "Dapeco fever."

Before World War II, the only known endemic area of schistosomiasis japonica on the island of Mindanao was in the northeastern section in the province of Surigao.[26] It is of historical interest that the type specimens of *Oncomelania quadrasi*, the molluscan host of *S. japonicum* in the Philippines and described by Moellendorf in 1895, were collected in Surigao. Studies carried on by the United States in 1945 showed that the disease is much more widely distributed on the island.[27]

---

[24] Pesigan, T. P.: The Endemicity of Schistosomiasis Japonica in Sorsogon, Southeastern Luzon. J. Philippine M.A. 24: 19–27, January 1948.

[25] Subsequent investigations conducted by the Army and Navy and, especially, a study sponsored by the Veterans' Administration have revealed that many of these unfortunate men had contracted the infection. In 1953, Dr. Harry Most, of the New York University College of Medicine, reported to the senior author that about 400 of the original 2,000 prisoners at the penal colony had survived internment and that 378 of the 400 had been studied since 1946. On the basis of one or more stool examinations, 116, or about 30 percent, of these men had been found to be passing viable eggs of *S. japonicum*. Repeated stool examinations and study of rectal biopsy specimens would probably have raised this percentage considerably, inasmuch as 50 percent of a small group of men studied shortly after their release from prison had been found positive.

[26] Africa, C. M., and Garcia, E. Y.: The Distribution of Schistosomiasis Japonica in the Philippines. Philippine J. Pub. Health 2: 54–62, 1935.

[27] Studies made by the Philippine Government since 1948 have also indicated that the disease is widely distributed on the island. It is now known to be present in every province except Misamis Oriental (Wright, W. H., McMullen, D. B., Faust, E. C., and Bauman, P. M.: The Epidemiology of Schistosomiasis Japonica in the Philippine Islands and Japan. II. Surveys for Schistosomiasis Japonica on Mindanao, Philippine Islands. Am. J. Hyg. 45: 164–184, March 1947). In addition, field investigators have found the molluscan host of the oriental blood fluke breeding in areas adjacent to the Mactan ricefields in which the prisoners of war had worked (Pesigan, T. P., Pangilinan, M. V., and Sarmiento, A. P.: Studies on Schistosomiasis: Further Surveys in Mindanao. J. Philippine M.A. 25: 417–433, September 1949).

Preventive measures taken before invasion of Leyte

By the middle of 1944, plans were being prepared for the recapture of the Philippines, with an initial landing to be made in Sarangani Bay in southern Mindanao on 15 November. This operation was to be followed by an airborne assault against Misamis Oriental in northwestern Mindanao on 7 December and by landings on Leyte on 20 December. In mid-September, it was decided to abandon the landings on Mindanao and, instead, to invade Leyte on 20 October. For security reasons, strictest secrecy was maintained about the change in plans. Consequently, medical personnel responsible for health problems encountered by task forces were not informed of the change in plans until a short time before the invasion. While these medical officers knew that schistosomiasis was endemic on Leyte, there was no real awareness of the danger that lay in the path of the invading troops. There was also, among persons responsible for the indoctrination of combat troops, a definite lack of information regarding the incidence of and dangers of acquiring schistosomiasis. In many instances, responsible medical and line officers who had received information concerning the disease either carried out no indoctrination of troops or, if they did attempt to indoctrinate their men, failed to leave any impression on them regarding the disease.[28]

Either before or at the time of the landings on Leyte, several higher headquarters issued information and directives concerning schistosomiasis. Included were the following:

1. A letter from Headquarters, Sixth U.S. Army, dated 1 October 1944, giving a brief description of schistosomiasis, together with instructions concerning the dangers of using stream or pond water for bathing, laundering clothes, or drinking.

2. A standing operating procedure from Headquarters, Base K [at Tacloban, Leyte], dated 1 October 1944, stating that unit commanders would designate areas along streams for obtaining drinking water, for bathing, for laundering clothes, and for washing equipment and vehicles.

3. A technical memorandum from the Office of the Chief Surgeon, USAFFE (United States Army Forces, Far East), dated 21 October 1944, containing a description of schistosomiasis, pointing out the dangers which were present in an area of proved or doubtful endemicity, and recommending that in these areas the following precautions be adopted insofar as the military situation permitted: (1) Fresh water from ponds, ditches, or streams should not be allowed to touch the skin nor be ingested, and troops should

---

[28] The consequences of a lack of awareness of the dangers of fresh water in areas endemic for schistosomiasis and of the failure to act to avoid infection are well illustrated by the episode which led to the high incidence of the disease in the British West African Force in 1944. More than 1,700 cases were diagnosed among troops who had engaged in amphibious training exercises and who had bathed in a fresh water lagoon at Epe, Nigeria. Before the exercises, no studies of the lagoon or of the native population were carried out, and medical officers of the division involved even regarded the risk of contracting schistosomiasis to be negligible. After the epidemic broke out, an investigation revealed that 100 percent of the natives who were examined had the disease and were releasing ova of *S. haematobium* in the urine.

avoid wading, bathing, or washing clothes in such water; (2) water should be obtained from newly driven casings reaching a depth of 10 or more feet; (3) where water must be drawn directly from streams, rapidly running water should be given preference as a source; and (4) all water should be hyperchlorinated (5 parts per million) for 30 minutes and then should be dechlorinated, and isolated detachments should boil all water used.

4. Warning issued to the XXIV Army Corps at the time of their landing at Leyte.

5. The Soldiers' Handbook of the Philippine Army, issued to troops before landings, briefly noting schistosomiasis and its occurrence in Leyte.

As an additional precautionary measure, two investigators were ordered to Leyte. These men, from the 19th Medical General Laboratory, Hollandia, New Guinea, and the 5th Malaria Survey Detachment, then stationed in New Guinea, landed on the island within the first 4 days of the fighting, with orders to initiate immediate surveys in the Leyte Valley to determine the distribution of the snail host of *S. japonicum* in surface waters and the infection rate in these mollusks, to identify reservoir hosts, and to investigate the incidence of schistosomiasis in the civilian population.[29]

Preventive measures taken after invasion of Leyte

On 27 October 1944, 7 days after the invasion, copies of reports on the 6-month schistosomiasis survey that had been carried out by the Philippine Government on Leyte during 1940 and 1941 were obtained in Tacloban, Leyte, from the Provincial Public Health Office. These reports, published by Tubangui and Pasco in 1941, provided the information regarding *S. japonicum* on the island, but this was the first time these studies had been seen by those responsible for indoctrination in the prevention of schistosomiasis. It was soon evident to the investigators that the endemic area extended over the entire Leyte Valley. With the cooperation of members of the Provincial Public Health Office, they located breeding places of the molluscan host, *Oncomelania quadrasi*, and observed the characteristics and habitat of this snail. On the basis of the new information obtained, a report incorporating pertinent facts not previously available was prepared by the senior author and submitted to the Surgeon, Sixth U.S. Army, about 1 November 1944. A new directive concerning schistosomiasis was not prepared.

With the facts obtained from the 1940–41 survey reports and from Filipino health personnel, it was possible for the special investigators and members of malaria survey detachments who had arrived on Leyte early in the campaign to initiate surveys of the breeding places of *O. quadrasi* and to carry on microscopic examination of stools to determine infection rates in the civilian population. These studies were limited to the localities of Palo, Tacloban, and Tolosa. During these first weeks, survey work was often re-

---

[29] Quarterly Report, Surgeon, Sixth U.S. Army, Southwest Pacific Area, 1 Oct. to 31 Dec. 1944.

stricted by combat activities in the area. In early December, the studies expanded as additional malaria survey detachments arrived and went to work. The officers of these units were informed on the appearance and habitat of *O. quadrasi* at a meeting held in late November.[30] This meeting was attended by the chief malariologist of the theater and the malariologists of the Sixth and Eighth U.S. Armies and Base K, and plans were drawn up for carrying on systematic field surveys. New information acquired through these surveys was to be used by combat and supply medical personnel to improve the indoctrination of troops already on the island and of newly arriving troops.

Significant contributions were made by the 5th, 6th, 34th, 41st, 205th, and 211th Malaria Survey Detachments. The 6th Malaria Survey Detachment was particularly active with a schistosomiasis educational program, in which the personnel prepared and distributed a large number of posters and erected warning signs along certain ditches in which *O. quadrasi* were found. A number of signs were also painted and erected by the 93d Malaria Control Detachment (fig. 4). As a result of the limited educational program, a few

FIGURE 4.—Warning sign posted by a malaria control detachment. Note Filipino woman washing clothing in a stream.

[30] Letter, Lt. Col. G. L. Orth, MC, Chief Malariologist, Army Service Command, to Brig. Gen. G. B. Denit, Chief Surgeon, USAFFE, 21 Nov. 1944.

commanding officers became highly conscious of the hazards of infection among men exposed to fresh water and strictly enforced the directives from higher headquarters. For example, the entire camp area of the 11th Airborne Division stretching along the coast for more than a mile was posted with warning signs.

Schistosomiasis was a disease relatively new to U.S. medical officers. Plans were made in December 1944 to treat a number of Filipino patients in the 118th General Hospital, Tolosa, Leyte. It seemed desirable to study the efficiency of various drugs, for example, antimony compounds, and to obtain as much information as possible before troops might require treatment as a result of exposure either in the Philippines or elsewhere in subsequent campaigns. This program was actively sponsored by the theater medical consultant.

In early December 1944, this medical consultant also planned for a survey of troops of the 21st Regiment, 24th Division, to determine whether or not any of the men had contracted schistosomiasis.[31] In late December, before any infected Filipinos were hospitalized or troops surveyed, the disease made its dramatic appearance among U.S. soldiers.[32]

Before December 1944, interest in schistosomiasis had been to a certain extent academic. It was felt by some Medical Department personnel that the disease would not be of military importance in Leyte. The various letters and memorandums which had been issued, it was assumed, would prevent outbreaks.

In spite of the precautions taken before and after the invasion to prevent schistosome infection in troops, information concerning the disease was not generally disseminated. Troops who were aware of the dangers of exposing themselves to fresh water tended to minimize the hazard or to ignore it almost completely. Out of the first 100 consecutive patients with schistosomiasis treated in the 118th General Hospital, only about 15 percent admitted ever having heard of the disease or of blood worms or flukes.[33]

There were several reasons for the exposure of large members of U.S. troops to schistosome cercariae on Leyte. Some of the various memorandums and letters ordering precautionary measures failed to reach units until several weeks after their arrival on the island. Wording of other memorandums made them unclear. Some streams declared to be free of the snail host of *S. japonicum* later proved to be infested. Some troops, especially combat engineers engaged in building bridges, were required to enter streams and swamps and to remain partly immersed for considerable periods of time.

---

[31] Letter, Col. Henry M. Thomas, Jr., MC, to Chief Surgeon, U.S. Army Services of Supply, Southwest Pacific Area, 13 Dec. 1944.

[32] Thomas, H. M., Jr., and Gage, D. P.: Symptomatology of Early Schistosomiasis Japonica. Bull. U.S. Army M. Dept. 4: 197–202, August 1945.

[33] Billings, F. T., Jr.: Experiences of the U.S. Army Medical Department With Schistosomiasis Japonica in World War. II. [Official record.]

Other causes of exposure of U.S. troops included the desire of the soldiers to wash their clothing and to go swimming, even though they were warned that fresh water might be dangerous. Also, excessive emphasis had been placed on the dangers of the ricefields, and many soldiers were of the opinion that these fields and swamps, rather than streams and fresh water, were the main sources of the infection. It was only when wells were dug and showers installed that stream water began to lose its attraction. Exposure of troops while laundering clothes was not so great on Leyte as on other Pacific islands, since most of the laundry was done by civilians (fig. 5). If clothing was

FIGURE 5.—Filipinos washing clothing in grassy marsh. Molluscan host of *S. japonicum*, *O. quadrasi*, was abundant here.

completely dry when worn, there was no danger from infection by cercariae that might adhere to the fabrics.

Outbreak of schistosomiasis japonica

During the period from the latter part of November through December 1944, the first patients with schistosomiasis were admitted to hospitals. These patients suffered from urticaria, cough, abdominal pain, diarrhea, and fever, and often had high eosinophil counts. Though the disease may have been suspected by some ward officers, it was not recognized. The first diagnosis of schistosomiasis in the area was made not in Leyte but on Biak Island, at

the 132d General Hospital, on 23 December 1944. Eggs of *S. japonicum* were found in a liver biopsy specimen taken from a soldier who had been evacuated from Leyte.[34] The second case was diagnosed on 29 December at the 19th Medical General Laboratory. The patient was a wounded soldier transferred from Leyte. It was not until the following day, 30 December, that the first cases were diagnosed on Leyte at the 36th Evacuation Hospital. Many other cases were identified within the next few days, and, by the end of January 1945, the number totaled about 70. By 1 March, over 300 cases had been admitted to hospitals.[35]

When the first cases of schistosomiasis were identified on Leyte, the hitherto academic interest of Medical Department personnel in the disease immediately changed to an acute apprehension of the possibility that a real epidemic might be developing. Ward officers became alert to the symptoms of the disease, and the hospital laboratories soon were swamped with stool specimens for microscopic study. At the same time, the malaria survey detachments redoubled their emphasis on field investigations.

A study of hospital records revealed that certain units were supplying a large percentage of the cases. This led to an investigation of the activities of personnel of the units, and it was apparent that swimming and bridge-repair operations probably accounted for the exposure of most of these men. In the 50th Engineer Combat Battalion, which eventually had 102 proved cases, bridge repair had led to the majority of the exposures (figs. 6 and 7). Among the detachment personnel of the 118th General Hospital, with about 75 proved cases, exposure came as a result of swimming. Swimming also accounted for proved cases of the disease in 144 of 560 men in an Australian Air Force construction squadron which had spent only 16 days on Leyte.[36] It became apparent early that the infection rate among infantrymen was relatively low. Totals compiled on 31 May 1945, for known cases among Eighth U.S. Army troops, the majority of which had been diagnosed in January and February, revealed that, out of 575 cases, 203 were from a small number of engineer battalions and 189 from numerous infantry units.[37]

Preventive measures taken after outbreak

Combat operations on Leyte passed from Sixth U.S. Army control to that of the Eighth U.S. Army during the last week of December 1944. In early January, with schistosomiasis now a very real entity, new and stronger directives concerning its prevention and calling for the disciplining of offend-

---

34 Letter, Maj. Maxwell G. Berry, MC, Chief of Medical Service, 117th Station Hospital, to Commanding Officer, 132d General Hospital, 24 Jan. 1945, subject: Treatment and Disposition of Patients With Schistosomiasis. First indorsement thereto with inclosure: Schistosomiasis Japonicum, Report of a Case.

35 Monthly report of Malariologist, Office of the Surgeon, Base K, Southwest Pacific Area, to Commanding General, U.S. Army Services of Supply, 6 Mar. 1945.

36 Dakin, W. P. H., and Connellan, J. D.: Asiatic Schistosomiasis: An Outbreak in the Royal Australian Air Force. M.J. Australia 1: 257–265, 1 Mar. 1947.

37 Sullivan, R. R., and Ferguson, M. S.: Studies on Schistosomiasis Japonica: III. An Epidemiological Study of Schistosomiasis Japonica. Am. J. Hyg. 44: 324–347, November 1946.

FIGURE 6.—Bridge built by combat engineers. Tributaries of this stream drained marshes in which the molluscan host of *S. japonicum* was plentiful.

ers, were issued by Headquarters, USAFFE, major commands in the Pacific, and subordinate commands. Typical was the letter issued on 22 January 1945 by the commanding general of Base K, the administrative headquarters for service units on Leyte not assigned to Army or Air Corps headquarters. This letter read in part:

> 1. Experience with this dangerous tropical blood fluke reveals that it is extremely common in this Base. The civilian population is heavily infected, and many cases have occurred in Army personnel, some of which have been fatal * * *.
>
> * * * * * * *
>
> 3. * * *. The following precautions will be observed: (a) All water used by troops will be obtained from approved water points * * *. This is meant to include water used for drinking, bathing, laundry, and washing of vehicles or floors. (b) Wading, bathing, and washing of clothing by troops in any fresh water river, swamp, pond, or rice field is prohibited * * *.
>
> 4. * * *. All unit commanders will inform their personnel of the contents of this directive, and will be held responsible for the rigid enforcement of the measures in paragraphs 3 a and b.

FIGURE 7.—Combat engineers repair bridge over a stream choked with water hyacinth. Molluscan host of *S. japonicum* was plentiful here.

Now that the Leyte campaign was ended, the majority of the units on the island were better established in camp areas; showers had been installed, and practically all fresh water for bathing and laundering was being obtained from wells. Vehicles were also being washed with water from wells. Bridge building was still being carried on, but engineers, now aware of schistosomiasis, were beginning to provide their personnel with rubber boots and flat-bottomed boats for work in water. However, in February it was still not unusual to see men swimming and washing clothing or vehicles in streams. When inquiries were made of these men, the majority pleaded ignorance of the disease and of the mode of infection.

During late January 1945, an intensive educational program got under way. The Chief, Professional Services, Office of the Surgeon, USAFFE, was largely responsible for the direction of this program. He insisted it be emphatically stressed to the troops that they must stay out of all fresh water. Excellent coordination work was also done by the Malariologist, Office of the Surgeon, Base K. Posters were distributed by Base K and the Office of the Surgeon, XXIV Army Corps. Of special interest and value was a cartoon published by the 81st Infantry Division (fig. 8). Numerous roadside signs were prepared and posted by the 5th Malaria Survey Detachment. Short, pertinent items regarding the disease were brought to the attention of troops by means of the radio and unit newssheets. The malaria detachments were

FIGURE 8.—Cartoon dealing with schistosomiasis. Used in educational program for prevention of schistosome infection conducted by the Office of the Surgeon, 81st Infantry Division.

asked to report to unit commanders any personnel found washing vehicles or bathing in fresh water and to be active in disseminating information about schistosomiasis through personal contact.

There was some discussion among Medical Department personnel responsible for this educational program as to the advisability of placing warning signs along streams, ditches, or swamps in which the snail host had been found. It was feared by some that troops might assume that an unmarked stream was free from infection. By this time, field studies were beginning to show that streams could apparently be infested with cercariae at points a mile or more below the breeding areas of the snails, which in most cases were swamps or vegetation-choked streams that drained into rivers. Epidemiological studies of outbreaks in certain units whose activities were known forced the conclusion, in the absence of the actual collection of cercariae, that active larval worms could be carried long distances in moving water from the point at which they emerged from the snail host. This is probably the most important conclusion drawn from the Army studies of the epidemiology of schistosomiasis japonica. Similar conclusions were to be found in the litera-

ture,[38] but the hazard of infection in streams in the absence of the snail host had not been emphasized.

A very significant contribution to the educational program was made by two mobile laboratories that were equipped and sent from unit to unit by the Office of the Surgeon, Base K, to acquaint troops with the disease. Two enlisted men, one the driver and the other a man qualified to discuss the disease, accompanied each truck and gave demonstrations and lectures before thousands of troops during a period of about 4 months (fig. 9). Schistoso-

FIGURE 9.—Mobile laboratory and lecturer giving a demonstration on the prevention of schistosomiasis before a group of soldiers.

miasis, or "schisto" as the disease was commonly known, became a byword with the troops in the field. The adoption of this term permitted the men to avoid use of a long word that was difficult to remember and pronounce. It was also much more appropriate than the term "snail fever" that was first proposed by the U.S. Navy and later used by the Office of the Surgeon General in the preparation of posters for distribution overseas (fig. 10).

---

[38] (1) Egan, C. H.: An Outbreak of Schistosomiasis Japonicum. J. Roy. Nav. M. Serv. 22: 6–18, January 1936. (2) Taylor, A. W.: An Inquiry into the Origin of an Outbreak of Schistosomiasis Among Europeans at Kagoro, Northern Nigeria. West African M.J. 5: 61–62, April 1932. (3) Ferguson, M. S.: Schistosome Infection by Cercariae Distant From Snail Foci. Kuba 3: 86–87, April 1947.

FIGURE 10.—Photograph of War Department poster prepared at request of Office of the Surgeon General for distribution to Army units in Far East.

The whole program of control of schistosomiasis in troops was a preventive one; that is, it stressed the avoidance of infested water. Control of the disease in the civilian population and in animals would be a long-term project involving snail control, proper disposal of feces, treatment of infected individuals, and destruction or treatment of reservoir hosts.

By April 1945, the number of new cases of schistosomiasis had dropped to a low level. The educational program and directives leading to strong command action were remarkably effective in limiting the number of new infections acquired in 1945. A study of case histories would seem to indicate that the majority of the exposures had occurred in late October and in November and December 1944. This was the period of combat operations, when troops had to go into infested waters in line of duty and when shower facilities for bathing were scarce. It was also the season of greatest rainfall in eastern Leyte, a period favorable for the multiplication of snails and for their infection by schistosome miracidia. These heavy rains probably served to flush out swamps and small vegetation-choked streams in which *O. quadrasi* was abundant, and live cercariae could have been transported in flooded rivers to locations where they were encountered by troops. Moreover, November and December were months during which those in command of troops were not yet keenly aware of the disease and most of the Medical Department personnel had only a hazy concept of schistosomiasis and did not believe that it would be of military importance in Leyte.

During January and February 1945, depending on the policy of the particular hospital, some patients were evacuated to the United States as soon as the diagnosis of schistosomiasis was made while others were evacuated after one course of treatment with an antimonial drug. Other patients were treated and held under observation for long periods on Leyte. Finally, in July 1945, the Surgeon, USAFFE, directed that all patients with schistosomiasis japonica be evacuated to the United States within a period of 120 days after the diagnosis had been established. The haphazard evacuation policy existing during the early weeks of the outbreak was seized upon by a few individuals as a possible means of getting home. Some of these men were known to have willfully exposed themselves to infection by swimming in streams considered dangerous. Others who were patients in hospitals for other causes were known to have attempted to purchase stools positive for *S. japonicum*, so that these fecal specimens could be submitted as their own.

Maj. Gen. Norman T. Kirk, The Surgeon General of the Army, indicated in a letter dated 26 March 1945 to the Surgeon, Headquarters, USAFFE, that schistosomiasis was considered to be a serious disease from the point of view of the patient but that, on the basis of information then available, it appeared unlikely that the disease would create a very great military problem. Among the hundreds of thousands of men who served in the Southwest Pacific, for either short or long periods during 1944 and 1945, 1,544 cases of schistosomiasis were diagnosed. It cannot be ascertained whether all these

cases occurred in Leyte. Relatively, this is a small number; however, in view of the fact that the average duration of hospitalization for schistosomiasis cases in the Philippines during 1945 was approximately 6 months, the disease assumed real military significance. Of further significance was the low morale of these infected men due to the long periods of hospitalization, the uncertainty of the medical officers as to the value of antimonial drugs being used, and the possibility that the disease might later assume a chronic phase. The apprehensiveness of the men with schistosomiasis could not be entirely confined to hospital areas; it carried over somewhat to healthy troops as well. This was particularly true of men who had been exposed to fresh water, either in line of duty or while bathing, and who had developed no clinical symptoms.

Investigations pointed toward control

Mention has been made of the field and laboratory studies carried out by the malaria survey detachments and special investigators during the early weeks of the Leyte campaign. Some useful information regarding *S. japonicum* was obtained by these workers both before and after the disease appeared in troops. However, it was difficult to coordinate the activities of these individual units, which were often widely separated and were under officers with varying degrees of training and interest in the problem of schistosomiasis. Coordination was also impeded by the fact that the units were assigned to Army Ground Forces, Army Air Corps, or Base K headquarters, and the investigators never knew when they might be alerted to move on to another island. In addition, most malaria survey detachments had other duties, such as making mosquito surveys and investigating sanitation conditions.

After the disease appeared, it became apparent that a group of interested persons should be assigned to work full time on the investigation of means of preventing further infection in troops. To do this, a broad study would have to be made of the whole schistosomiasis problem in Leyte. Finally, in February 1945, the 5th Malaria Survey Detachment was reassigned from the Eighth U.S. Army to Base K headquarters and was designated as a schistosomiasis research unit, with the privilege of acquiring necessary equipment not included on the regular table of equipment of malaria survey detachments. About this time, the malaria research unit formed in Australia in 1943 arrived on Leyte and turned its attention from problems of malaria to those concerning schistosomiasis japonica. These two units set up adjoining laboratories at the 118th General Hospital near Tolosa and carried on a joint investigational program until after the end of the war in the Pacific.

On 25 April 1945, the Subcommission on Schistosomiasis, Commission on Tropical Diseases, Army Epidemiological Board, arrived on Leyte from the United States.[39] A laboratory was set up in Tacloban. The members of the

[39] See footnote 12, p. 54.

Subcommission contemplated a program of study embracing the field and laboratory observation of the biology of *O. quadrasi*, the schistosome infection in the snail host, the emergence and longevity of the cercariae in water, and field trials of molluscacides. Studies of the epidemiology of schistosomiasis japonica were to be carried out, reservoir hosts were to be identified, laboratory methods of diagnosing the disease were to be investigated, and the protective value of clothing was to be determined.[40]

When the Subcommission on Schistosomiasis was formed in the United States, there was the distinct possibility that U.S. forces would not only invade Japan but also would make landings along the coast of China, where schistosomiasis is a serious problem, especially south of the Yangtze River. Consequently, the investigations to be undertaken by the Subcommission were not intended to relate solely to the schistosomiasis problem as it existed in the Philippines.

In May 1945, three naval officers comprising an epidemiological team from Naval Medical Research Unit No. 2, located on Guam, came to Leyte. Since only 16 proved cases of schistosomiasis had appeared among Navy personnel,[41] no extensive investigations were planned by this group.

The Subcommission on Schistosomiasis, the Malaria Research Unit together with the 5th Malaria Survey Detachment, and the Navy epidemiological team each planned and carried on their own respective investigational programs. There was some imperfection in the collaboration of the three groups, but cooperative projects were developed by the Subcommission in association with the 5th Malaria Survey Detachment and the Malaria Research Unit and by one member of the Navy team in association with the Army research groups. The latter were most fortunate in having Lt. R. Tucker Abbott of the Navy team, an expert on mollusks, work with them, for until the time of Lt. Abbott's arrival on Leyte there had been no one who could identify snails found in the fresh waters of the island.

The Army and Navy groups remained on Leyte until after the war ended in September. In late October, some of the members of the Subcommission on Schistosomiasis and the commanding officer of the Medical Research Unit proceeded to Japan, where studies were made of the distribution of the disease and its intensity in the natives in endemic areas.[42]

Early in 1945, when the members of the Medical Research Unit and 5th Malaria Survey Detachment, all of whom had been overseas for nearly 2 years, undertook intensive schistosomiasis investigations, they were handicapped by lack of access to the literature. Exchange of information between these investigators and research workers in the United States was severely restricted because of the security regulations in the Southwest Pacific Area. Even

---

[40] Annual Report, Commission on Tropical Diseases, Army Epidemiological Board, 19 Apr. 1945–19 Apr. 1946.

[41] Hunt, A. R.: Schistosomiasis in Naval Personnel, a Report of Sixteen Cases. U.S. Nav. M. Bull. 45: 407–419, September 1945.

[42] See footnote 12, p. 54.

559625v—61——7

reports that could have been of little value to the enemy were routinely classified as "Secret," and consequently copies of these reports that were forwarded to Washington were given limited circulation. The arrival of the Subcommission on Schistosomiasis and the Navy epidemiological team provided those who had been in the field a long time an opportunity to become acquainted with schistosome research programs then in progress in the United States and also a chance to examine additional literature relating to blood flukes.

The results obtained by the schistosomiasis research groups demonstrated that, in spite of the handicaps encountered in a combat area, much can be accomplished by field investigations. These findings are incorporated in a series of papers, the most important of which are briefly summarized in following paragraphs.

Survey and diagnostic methods.—Studies were made, and illustrations were prepared of the eggs of *S. japonicum* from the newly laid stage, through the development of the mature egg containing a motile miracidium, and including the degenerating stage.[43] These studies were prompted by the difficulties that certain hospital laboratories encountered in attempting to diagnose the disease in patients whose stools did not contain mature eggs. In several instances, positive diagnoses were made on men who probably did not have the disease, when objects that were believed to be eggs were merely artifacts such as plant cells and oil droplets. An instance of such a series of mistaken diagnoses was the outbreak reported among the personnel of a station hospital who, although resident in an endemic area on Leyte, had never made real contact with infested water.[44] Recovery of the eggs of the parasite from the stool, through the use of standard techniques or modifications of them, was found to constitute the only method of specific diagnosis of schistosomiasis japonica.[45]

Serologic studies revealed that in intradermal tests antigen prepared from adults of *S. mansoni* gave a high percentage of positive reactions in Filipinos with chronic cases but negative results in recently infected U.S. soldiers. Whereas a high percentage of proved cases of schistosomiasis japonica in U.S. military personnel were positive on the flocculation test, 100 percent of the studied chronic cases in Filipinos were positive to this test. The formol-gel tests on blood serums from U.S. soldiers were all nega-

---

[43] (1) Bulletin, Office of the Chief Surgeon, Headquarters, Army Forces, Pacific, 10 June 1945, subject: Guide for the Identification of the Ova of *Schistosoma japonicum*, pp. 1–6. (2) Faust, E. C.: The Diagnosis of Schistosomiasis Japonica. II. The Diagnostic Characteristics of the Eggs of the Etiologic Agent *Schistosoma japonicum*. Am. J. Trop. Med. 26: 113–123, January 1946.

[44] (1) Leavitt, S. S., and Beck, O. H.: Schistosomiasis Japonica; A Report of Its Discovery in Apparently Healthy Individuals. Am. J. Trop. Med. 27: 347–356, May 1947. (2) Quarterly Report, Surgeon, 13th Station Hospital, Southwest Pacific Area, 1 April–30 June 1945.

[45] (1) Bang, F. B., Hairston, N. G., Graham, O. H., and Ferguson, M. S.: Studies on Schistosomiasis Japonica. II. Methods of Surveying for Schistosomiasis Japonica. Am. J. Hyg. 44: 315–323, November 1946. (2) Faust, E. C., Wright, W. H., McMullen, D. B., and Hunter, G. W., III: The Diagnosis of Schistosomiasis Japonica. I. The Symptoms, Signs and Physical Findings Characteristic of Schistosomiasis Japonica at Different Stages in the Development of the Disease. Am. J. Trop. Med. 26: 87–112, January 1946. (3) Faust, E. C., and Ingalls, J. W.: The Diagnosis of Schistosomiasis Japonica. III. Technics for the Recovery of the Eggs of *Schistosoma Japonicum*. Am. J. Trop. Med. 26: 559–584, September 1946.

tive; in contrast, a fairly high percentage of serums from Filipinos with chronic cases reacted positively to this test.[46]

A liver index, the average enlargement of the liver in children ranging in age from 5 to 15 years, was found to be useful in assessing the endemicity of schistosomiasis japonica in an area and in giving a clue to the health of that community. Failure to find the molluscan host in an area was no evidence that the disease was not present, but the infection rate in reservoir hosts—for example, dogs, pigs, and rats—proved to be a good indicator that the people had schistosomiasis japonica.

Epidemiology.—Field studies revealed new areas of infection on Mindoro and Mindanao, Philippine Islands.[47]

A detailed study of the infection in the 50th Engineer Combat Battalion and its relation to activities involving contact with fresh water was undertaken in January 1945. It was revealed that bridge building and repair were responsible for the majority of the 102 cases of the disease. Swimming was not an important factor. It was found that an eosinophil survey of the men in the battalion served as a useful case finder. One of the most important conclusions drawn from this study was that a stream may be infective at least a mile below the point where infected snails are located. This is possible since the cercariae come to the top of the water, attach to the surface film, and therefore can be carried downstream. Consequently, failure to find the snail host at a certain point in a stream is no criterion of safeness for swimming or activities involving contact with water.

Molluscan intermediate host.—Laboratory studies on the hatching of eggs of *S. japonicum* containing mature miracidia revealed that light has no effect on the process and that there was no diurnal or nocturnal cyclic frequency in the hatching rates. Best hatching was obtained when feces were comminuted in river water having a pH of 7.6.[48] It was likewise observed that the largest number of cercariae were released from infected *O. quadrasi* when the mollusks were placed in river water having a pH of 7.6. Cercariae were liberated cyclically, being discharged on 2 or 3 successive nights between 9 and 11 p.m., after which few larvae would emerge over the next 2 or 3 days.[49]

Studies in prevention.—The eggs of *O. quadrasi* were found to be laid singly. They are cemented to the surface of damp, decaying vegetation and

46 Wright, W. H., Bozicevich, J., Brady, F. J., and Bauman, P. M.: The Diagnosis of Schistosomiasis Japonica. V. The Diagnosis of Schistosomiasis Japonica by Means of Intradermal and Serological Tests. Am. J. Hyg. 45: 150–163, March 1947.

47 Hunter, G. W., III, Dillahunt, J. A. and Dalton, H. C.: The Epidemiology of Schistosomiasis Japonica in the Philippine Islands and Japan. I. Surveys for Schistosomiasis Japonica on Mindoro, P.I. Am. J. Trop. Med. 30: 411–429, May 1950.

48 Ingalls, J. W., Jr., Hunter, G. W., III, McMullen, D. B., and Bauman, P. M.: The Molluscan Intermediate Host and Schistosomiasis Japonica. I. Observations on the Conditions Governing the Hatching of the Eggs of *Schistosoma japonicum*. J. Parasitol. 35: 147–151, April 1949.

49 Bauman, P. M., Bennett, H. J., and Ingalls, J. W., Jr.: The Molluscan Intermediate Host and Schistosomiasis Japonica. II. Observations on the Production and Rate of Emergence of Cercariae of *Schistosoma japonicum* From the Molluscan Intermediate Host, *Oncomelania quadrasi*. Am. J. Trop. Med. 28: 567–575, July 1948.

are covered with a layer of fine sand grains and organic matter. The biology and life cycle of the mollusk were carefully studied, and it was determined that this snail may reach maturity in from 4 to 5 months.[50] Laboratory tests showed that the eggs of *O. quadrasi* were killed rapidly by two dinitro compounds, dinitro-ortho-cyclohexylphenol and its dicyclohexylamine salt.

Field studies were conducted on the molluscacidal properties of 19 chemicals. Results indicated that the two dinitro compounds mentioned were promising.[51] After the war, these experiments on molluscacides were continued in Japan. Any program of snail control is faced with the problems of the cost and application of materials and the effect of the molluscacide on vegetation and animal life in the water. It was evident from the beginning that control of schistosomiasis japonica through snail destruction would be a long-term project and therefore not a practical military procedure.

The cercaricidal effects of the Army's routine water chlorination methods were tested in the laboratory, and it was found that these procedures provided an ample margin of safety against the ingestion or penetration of live cercariae. If water had a residual chlorine strength of 1 p.p.m. after one-half hour, it was safe for drinking or bathing even though taken from an infested stream.

In Leyte, the question arose as to whether ocean bathing near the mouths of rivers carrying water from marshes and streams infested with *O. quadrasi* constituted a health hazard. It was determined that sea water with a 3-percent salinity killed cercariae of *S. japonicum* in less than 3 minutes and therefore was safe for bathing. Areas near the mouth of a river where sea water is diluted to less than 1.5-percent salinity were considered to be potentially dangerous.[52]

Information was required by the Army regarding any preparation that could be applied to the skin to protect against the penetration of cercariae; for example, for use on the hands of men who were required to work in water. In vitro tests and in vivo tests with rats and mice suggested that troops could be afforded this protection by skin applications of the liquids, dimethyl

---

[50] McMullen, D. B.: The Control of Schistosomiasis Japonica. I. Observations on the Habits, Ecology and Life Cycle of *Oncomelania quadrasi*, the Molluscan Intermediate Host of *Schistosoma japonicum* in the Philippine Islands. Am. J. Hyg. 45: 259–273, May 1947.

[51] (1) McMullen, D. B., and Graham, O. H.: The Control of Schistosomiasis Japonica. II. Studies on the Control of *Oncomelania quadrasi*, the Molluscan Intermediate Host of *Schistosoma japonicum* in the Philippine Islands. Am. J. Hyg. 45: 274–293, May 1947. (2) McMullen, D. B., Komiyama, S., Ishii, N., Endo-Itabashi, T., and Mitoma, Y.: Results Obtained in Testing Molluscacides in Field Plots Containing *Oncomelania nosophora*, an Intermediate Host of *Schistosoma japonicum*. Am. J. Trop. Med. 31: 583–592, September 1951. (3) McMullen, D. B., Komiyama, S., Ishii, N., Endo-Itabashi, T., Ozawa, K., Asakawa, T., and Mitoma, Y.: The Use of Molluscacides in the Control of *Oncomelania nosophora*, an Intermediate Host of *Schistosoma japonicum*. Am. J. Trop. Med. 31: 593–604, September 1951. (4) Hunter, G. W., III, Ritchie, L. S., Freytag, R. E., Pan, C., and Potts, D. E.: "Operation Santobrite," a Schistosome Snail Eradication Program in Japan. J. Parasitol. 37: 31–32, November 1951 (Supp.).

[52] Ingalls, J. W., Jr.: The Control of Schistosomiasis Japonica. III. Studies on the Longevity of Cercariae of *Schistosoma japonicum* in Saline Solutions. J. Parasitol. 32: 521–524, December 1946.

phthalate, dibutyl phthalate, benzyl benzoate, Rutgers 612, and Indalone, or salves containing these insect repellents.[53]

The protective value of military clothing required investigation. The protection afforded by rubber boots or waders to men who entered infested water was obvious. It was known by the Japanese that domestic animals could be protected from schistosome larvae by providing them with waterproof leggings or a double layer of cotton cloth with a mesh not more than 100 microns.[54] In vitro tests and in vivo tests with rats and mice suggested that all types of Army uniform cloth would afford considerable protection to the wearer. Old and worn uniform fabrics afforded less protection than new fabrics.[55]

Army uniform clothing materials, when impregnated with the insect repellents dimethyl phthalate, dibutyl phthalate, benzyl benzoate, or emulsions containing one or more of these substances, were highly protective to animals. Some of the chemically treated materials continued to afford protection after several washings or after days of continuous soaking in water.[56]

It was concluded, from the tests on applications to the skin and on impregnation of fabrics, that military personnel who had to enter water would be afforded a great degree of protection from schistosome cercariae if their hands were smeared with insect repellent or with salves incorporating a repellent, and if they wore chemically treated uniforms and socks and tucked trousers into the combat boots.

Treatment.—In any extensive study pointed toward the prevention of a disease, control through treatment of infected individuals should be considered, and the effect of a drug on the causative agent should be ascertained. The guinea pig was selected as an experimental animal, since the pathological pattern of schistosomiasis japonica in this animal was found to be similar to that in man. Fuadin, tartar emetic, and Anthiomaline were tested as chemotherapeutic agents. The effects of the drugs on the adult worm was first to cause the degeneration of the yolk glands in the female and then of the ovary and, finally, a shrinking of the whole worm. Treatment beyond 4 to 6 weeks killed large numbers of worms. The drugs had no effect on the eggs. Relapses occurred in the experimental animals and were due to a recovery by the females of their ability to produce eggs and

[53] (1) Ferguson, M. S., Graham, O. H., Bang, F. B., and Hairston, N. G.: Studies on Schistosomiasis Japonica. V. Protection Experiments Against Schistosomiasis Japonica. Am. J. Hyg. 44: 367–378, November 1946. (2) Wright, W. H., Bauman, P. M., and Fry, N. H.: The Control of Schistosomiasis Japonica. VII. Studies on the Value of Repellents and Repellent Ointments as a Protection Against Schistosomiasis Japonica. Am. J. Hyg. 47: 44–52, January 1948.

[54] Faust, E. C., and Meleney, H. E.: Studies on Schistosomiasis Japonica. Am. J. Hyg., Monographic Series, No. 3, 1924.

[55] Hunter, G. W., III, Bennett, H. J., Fry, N. H., See, J., and Greene, E.: The Control of Schistosomiasis Japonica. V. Studies on the Penetration of Various Types of Unimpregnated Uniform Cloth by Cercariae of *Schistosoma japonicum*. Am. J. Trop. Med. 29: 723–737, September 1949.

[56] Wright, W. H., Bauman, P. M., and Fry, N.: The Control of Schistosomiasis Japonica. VI. Studies on the Chemical Impregnation of Uniform Cloth as a Protection Against Schistosomiasis Japonica. Am. J. Hyg. 47: 33–43, January 1948.

return of adult female worms from the liver to the mesenteric veins.[57] It was concluded that relapse in man following treatment is nothing more than the recovery of reproductive functions by a surviving worm when the concentration of a drug is no longer damaging to it. These relapses may occur within a few weeks.[58] That adult schistosomes can recover from the effects of antimonial drugs (Fuadin and tartar emetic) and be productive of viable eggs 5 years later was demonstrated in followup studies of a group of U.S. Army veterans who had acquired schistosomiasis japonica in the Philippines. In a carefully studied group of five individuals, proved to have had the disease, four were demonstrated by rectal biopsy to be infected after this lapse of time. One man had had six courses of antimonial treatment during 1945. This continued egg productivity of *S. japonicum* for more than 5 years had been demonstrated similarly in untreated monkeys experimentally infected in Leyte and Japan in 1945 and brought to the United States for long-term study of the infection.[59] The fact that human beings, and possibly the reservoir hosts, may retain their infection for several years emphasizes the necessity of preventing feces of infected people and animals from reaching fresh water in areas where the appropriate snail host exists but where, as yet, schistosomiasis has not been introduced.

Directive on control

With the end of the war in early September 1945, preparations were made for occupation troops to proceed to Japan. In this connection, a directive, Circular No. 68, concerning the control of schistosomiasis japonica was issued by Headquarters, United States Army Forces, Pacific, on 11 September 1945. In addition to giving information about known areas of the disease in the Japanese islands, defining responsibility of unit commanders for indoctrination of troops, and ordering disciplinary action against violators of regulations pertaining to swimming, bathing, and so forth, in fresh water, the circular ordered the use of protective measures suggested in the investigational studies described. Bathing in sea water was to be permitted only when the salt content was 3 percent or above. Troops whose work required exposure to infested water were to wear uniforms made from cloth found to provide a barrier to cercariae and were to tuck their trousers into the combat boots. It was also stated that the protective value of the

---

[57] Bang, F. B., and Hairston, N. G.: Studies on Schistosomiasis Japonica. IV. Chemotherapy of Experimental Schistosomiasis Japonica. Am. J. Hyg. 44: 348–366, November 1946.

[58] (1) Letter, 5th Malaria Survey Detachment and Medical Research Unit, to The Surgeon General, 25 June 1945, subject: Report No. 5: Reappearance of Ova in the Feces of Schistosomiasis Patients After Fuadin Treatment. (2) Most, H., Kane, C. A., Lavietes, P. H., Schroeder, E. F., Behm, A., Blum, L., Katzin, B., and Hayman, J. M.: Schistosomiasis Japonica in American Military Personnel: Clinical Studies of 600 Cases During the First Year After Infection. Am. J. Trop. Med. 30: 239–299, March 1950.

[59] (1) Liu, C., and Bang, F. B.: Report to Veterans Administration. A Followup Study of Veterans Infected With *Schistosoma japonicum* Five Years Previously. 1950 (unpublished). (2) Liu, C., and Bang, F. B.: The Natural Course of a Light Experimental Infection of Schistosomiasis Japonica in Monkeys. Bull. Johns Hopkins Hosp. 86: 215–233, April 1950.

clothing is enhanced by impregnation with insect repellent and that applications of insect repellent were to be made to the hands of those who were required to work in fresh water.

CONCLUSIONS AND SUMMARY

Down through the ages, military operations have been responsible many times for the exposure of troops to water containing schistosome cercariae; for example, in the crossing of streams and during the building or repair of bridges. Infested water was probably often used for drinking purposes. However, in view of the U.S. Army experience with schistosomiasis in the Philippines during World War II, the writers estimate that the majority of the cases of the disease acquired by soldiers in former times resulted from exposures while they bathed in or drank infested waters. Thus, if the means by which schistosomiasis was contracted had been known and the knowledge could have been applied, most of the infections could have been prevented.

When World War I broke out in 1914, the life history of *S. japonicum* was known. By 1915, the life cycles of *S. mansoni* and *S. haematobium* had also been elucidated. From then on, if troops were properly indoctrinated, there could be little excuse for their acquiring schistosomiasis as a result of swimming and the ingestion of untreated water. That schistosomiasis is a preventable disease is borne out by the experience of the Australians and British in the Middle East early in World War I. In Egypt and Mesopotamia, exposure was largely through swimming, sometimes in spite of repeated warnings regarding the dangers of entering fresh water. That schistosomiasis is a preventable disease in military forces was stated by Leiper, on the basis of his studies in Egypt in 1915.[60] He wrote: "With the information at the disposal of troops, bilharziasis should now be treated as one of those diseases for which the individual is mainly, if not entirely, personally responsible." However, the exposures that led to the infection of more than 1,700 men in the British West African Force in 1944 were apparently not the responsibility of the individual soldier. The important point to consider here is that the infections could have been prevented.

The importance of prevention of schistosome infections in troops is emphasized by the facts that there is no drug known to be prophylactic for schistosomiasis and that chemotherapeutic agents in current use are inadequate.[61] The pathological consequences that may stem from the presence of living schistosomes in the blood vessels over a number of years also give emphasis to the importance of developing prophylaxis.[62]

In connection with any military operation there are factors which tend to modify the preventability of a disease such as schistosomiasis. Changes

---

60 Leiper, R. T.: Report on the Results of the Bilharzia Mission in Egypt, 1915. J. Roy. Army M. Corps 30: 235–260, March 1918.

61 See footnote 58(2), p. 78.

62 See footnote 59(1), p. 78.

in tactics, military reverses, unavoidable accidents, the loss of protective equipment, and so forth, can make the amount of contact with infested water unpredictable. However, a study of the activities of the large number of combat engineers who became infected while building or repairing bridges on Leyte, work that called for long periods of exposure, indicated that most, if not all, of their disease could have been prevented if rubber boots, waders, flat-bottomed boats, and protective applications for the hands had been provided.[63] The length of time spent in infested water and the amount of clothing worn by the individual were found to be very important. Eight men from a medical unit who went swimming in a stream on Leyte for only half an hour all became infected. In contrast, of the thousands of fully clothed infantrymen who must have waded in streams, swamps, and flooded ricefields in the Leyte Valley, only a relatively small number developed clinical schistosomiasis. These observations suggest that clothing, even though not impregnated with chemicals, is highly protective against cercariae. The value of clothing in preventing infection was suspected in China by Laning even before the cercarial stage of *S. japonicum* had been identified,[64] and the Japanese have long recognized that protection is afforded by clothing.

When preparations are being made for operations in an area endemic for human schistosomes, knowledge of the distribution and intensity of the disease existing there is most important. The degree to which medical officers are aware of the available facts determines in great measure the success attending efforts to indoctrinate troops concerning the disease and its prevention. The medical officer has the important responsibility of seeing to it that the line officers with whom he is associated become keenly aware of the preventability of schistosomiasis; to accomplish this, he must be thoroughly familiar with the disease. Finally, preparations for a military operation in an endemic area should include plans on the part of medical personnel for conducting field research on schistosomiasis and its control.

Good schistosomiasis discipline on the part of troops demands an intensive educational program through which the men become adequately informed as to the dangers of exposure to fresh water in endemic areas. This training would require use of the varied mediums of communication: for example, printed matter, posters, films, lectures, demonstrations, the radio, and television. Troops must become thoroughly familiar with the slogan, "In Endemic Territory Keep Out of All Fresh Water." They must learn that under no consideration should they bathe in or drink fresh water from a stream. Responsible officers must realize that men should not be required to wade or work in water unless the exposed parts of the body are fully protected. In any educational program concerning the dangers of acquiring schistosomiasis and the means of preventing infection, the harmful effects of the disease must be stressed, and a little overemphasis is required. This will

[63] See footnote 37, p. 65.

[64] Laning, R. H.: Schistosomiasis on the Yangtze River, With Report of Cases. U.S. Nav. M. Bull. 8: 16–36, January 1914.

be a matter of concern to those who may already have acquired the disease and may cause some to become overly anxious, as was the case among U.S. soldiers who were being treated for schistosomiasis in hospitals on Leyte.[65] However, an effective educational program is essential, since it is concerned with the health and fighting capacity of the combat force in general.

Investigations on schistosomiasis carried on in the field during a military operation would of necessity be mainly concerned with prevention of the disease and treatment of infected troops. Since, in schistosome infection, there is a long period between the time of exposure and the appearance of eggs in the feces, large numbers of soldiers could be infected before the disease was diagnosed. Therefore, since research requires time to yield results, field investigations, if they are to be useful, must be pursued energetically from the time the troops enter an endemic area. Because it has been amply demonstrated that the absence of the snail host of schistosomes is no proof that the water in a stream or body of water is safe, investigators must make careful surveys to determine the breeding places and incidence of infection of the molluscan host. Studies on improved protective measures for those who must come in contact with fresh water should be pursued both at home and in the field. This would also involve the search for an orally administered drug that is prophylactic for schistosome infection. Likewise, investigations on improved diagnostic methods, for example, for the recovery of ova in stool specimens and serologic tests, would be necessary. Finally, there should be a continuing search for an adequate chemotherapeutic agent to treat those who might become infected.

As a result of World War II, approximately 2,500 cases of schistosomiasis were recorded for the U.S. Army. Approximately 850 of these infections were *S. mansoni* in Puerto Rican soldiers who had acquired blood flukes at home before entering military service. Only about 20 cases of infestation with *S. haematobium* were identified in U.S. soldiers. These 20 soldiers became infected in 1943 during the North African campaign. An epidemic of schistosomiasis japonica developed in the Philippines, due to infections acquired on Leyte late in 1944 and early in 1945; 1,661 cases of this disease were diagnosed for the entire Pacific area. In addition, it has been shown that, of the U.S. prisoners of war interned in southern Mindanao, 120 or more contracted schistosomiasis japonica.

With the exception of troops who acquired their infection in Puerto Rico and the prisoners of war who were forced to work in infested water, U.S. troops were exposed to schistosome cercariae largely through swimming and other noncombat activities. Probably not more than 10 percent of the infections resulted from combat activities. Therefore, in the light of the experience on Leyte, it may be concluded that, in military forces, schistosomiasis is largely a preventable disease.

---

65 Frank, J. D.: Emotional Reactions of American Soldiers to an Unfamiliar Disease. Am. J. Psychiat. 102: 631–640, March 1946.

559625°—61——8

CHAPTER VII

Skin Infections

Col. Franklin H. Grauer, MC, Samuel T. Helms, M.D., and Theodore H. Ingalls, M.D.

Part I. Fungus Infections

GENERAL CONSIDERATIONS

The story of the control of fungus infections in World War II is a series of paradoxes. Although these infections, in themselves, seldom produce serious consequences, they were responsible, in all theaters of war including the Zone of Interior, for a heavy loss of days from duty. They also required an undue amount of medical attention in outpatient clinics as well as in hospitals, where they required an undue bed occupancy. Their prevention and control were a rather hopeless task. To begin with, medical officers were confronted with a varying amount of infection, both active and latent. All the circumstances were favorable to the development of recurrence, reinfection, and relapse. Fresh infections in new hosts also required treatment.

Even in civilian life, the prevention and control of fungus infections are difficult. In the circumstances of warfare, the task was close to impossible for the reason that the best methods of prevention are based on personal hygiene, and personal hygiene in time of war is always difficult and frequently entirely impractical.

The Medical Corps, from its peacetime experience, was fully aware of the nature of the problem which it would encounter in wartime. In 1941, U.S. Army statistics indicated that skin diseases, including the mycoses, were responsible for 8.2 percent of all admissions and for 7.2 percent of all days lost from disease; the figures relate to hospitals and quarters and not to hospitals only. Since most dermatological patients are ambulatory and are managed in outpatient dispensaries rather than in hospitals and quarters, the chances are that the statistics just cited do not give a true picture of the real incidence of dermatological disease.

In the Manual of Dermatology, which was published in 1942, Maj. Gen. James C. Magee, The Surgeon General, called attention to the importance of dermatological disease in military life in his foreword to this volume. Diseases of the skin, he pointed out, are of greater importance in military service

than they are in civilian life. Although they cause few fatalities, they result in a considerable loss of effective manpower and in the partial incapacity of a significant number of personnel of many commands.

Although ground troops, because of the particularly unfavorable conditions under which they operated, had more dermatophytosis than any other component of the Army, skin diseases were also a problem in the Army Air Forces, in both flying and nonflying personnel. These diseases were less of a problem in the Navy because personal hygiene was reasonably simple to maintain on shipboard; showers and frequent changes of clothing were usually possible. On submarines, especially when they were operating in tropical waters, high temperatures and intense humidity produced less favorable conditions.

Coccidioidomycosis.—During World War II, the only deep fungus infection of military significance was coccidioidomycosis, which affected only troops stationed in the southwestern part of the United States, particularly the San Joaquin Valley in California and certain portions of Arizona and Texas.

These areas, in which the disease was endemic, were ideal for flying because of their almost continuously clear weather. They also served admirably for the desert training of armored troops. Areas which were known to be heavily infected were avoided, as far as possible, but military necessities sometimes dictated their extensive use. Since infection is usually acquired by the inhalation of spores present in the dust in dry and sandy regions, the troops stationed in these areas were unavoidably exposed. The infectiousness of some areas was discovered only when the disease appeared in the troops stationed there or when positive reactions to the coccidioidin test occurred in troops previously stationed or bivouacked there.

Coccidioidomycosis, like other deep fungus infections, is not primarily a dermatologic problem since the involvement of the lungs, of other viscera, and of the lymphatic system is more important than involvement of the skin. The entire subject is discussed in another volume of the history of the Medical Department in World War II and therefore needs no further consideration here.[1]

EARLY CONCEPT OF THE CONTROL OF FUNGUS INFECTIONS

The opinions of The Surgeon General concerning the prophylaxis of fungus infections of the skin before the United States entered World War II were contained in three publications: (1) War Department Circular No. 47, dated 30 August 1938; (2) War Department Basic Field Manual 21–10, Military Sanitation and First Aid, 1940; and (3) War Department Medical

[1] Medical Department, United States Army. Preventive Medicine in World War II. Volume IV. Communicable Diseases Transmitted Chiefly Through the Respiratory and Alimentary Tracts. Washington: U.S. Government Printing Office, 1958, ch. XVI, Coccidioidomycosis.

Field Manual 8–40, Field Sanitation, 1940. In substance, these publications contained the following material:

The spread of the causal agents of ringworm infection is by person-to-person contact. Tinea cruris is also transmitted by clothing, towels, bathroom floors, and toilet seats. Ringworm of the extremities is spread by contact of the bare feet with floors, mats, benches, and chairs in bathrooms, gymnasiums, clubs, and swimming pools. It is also spread by towels and by slippers, shoes, and other articles of clothing worn next to the skin. The fungi may persist for a long time in and on these various objects.

Control measures for all forms of ringworm infection are based on the same general principle; namely, to prevent the bare skin of noninfected persons from coming into contact with objects which may have been contaminated by infected persons.

Daily baths and the use of a drying powder in the axillary regions and on the perineum after the bath are essential measures of prevention of tinea cruris. Equal parts of boric acid, zinc oxide, and starch make a satisfactory powder.

The feet should be carefully inspected at the regular monthly inspection and at all other foot inspections. All cases of trichophytosis and of tinea cruris should be promptly reported. Even slight cases should be thoroughly treated to eliminate the sources of infection. Acute cases of tinea cruris require hospitalization in order to prevent spread. If an unusual number of cases of ringworm or tinea cruris appear, sanitary precautions should be investigated to make sure that they are being rigidly enforced.

To prevent ringworm of the extremities, the feet should be kept dry, and the areas between the toes should be given particular attention after the bath. If there is a tendency to perspiration, issue foot powder should be applied twice daily. Formaldehyde and other drying solutions should be used only on the advice of a medical officer.

If ringworm of the extremities is prevalent in a command, special precautions are required.

Disinfection is considered the most effective control measure. Bathhouse floors and equipment, including mats, benches, and chairs, are to be scrubbed daily, first with soap and water and afterward with some disinfectant, such as the solution of calcium hypochlorite used for footbaths or 2 percent cresol. Shower baths should be provided with removable duckboards, which are scrubbed and exposed to sunlight for several hours each day.

Bathhouses should be equipped with footbaths located at the entrance of the showers and sufficiently large to insure that it would be impossible not to step into them before and after the shower. When possible, different tubs should be provided for use before and after the bath. The tubs should be constructed of concrete or rubber, since solutions of calcium hypochlorite

are affected by metal and wood, and should be at least 6 inches deep. The reasons for the use of the tubs should be carefully explained.

The exchange or common use of towels, gymnasium suits, and similar articles is to be avoided unless they have been thoroughly disinfected by boiling or in some other manner. Leather and rubber goods can be disinfected with cresol solution. Shoes can be disinfected by pouring 1-percent thymol solution in gasoline or alcohol into them and allowing it to evaporate. Individual rubber slippers were recommended to prevent contact of the bare feet with infected surfaces.

Regulations for the use of swimming pools include restriction on the number of bathers allowed in them at any one time and between intervals of cleaning and draining; a preliminary, thorough soap-and-water bath; a preliminary footbath in calcium hypochlorite solution; exclusion from the pool of all ill persons; and continuous disinfection of the water, preferably with a chlorine solution.

CHLORINE DISINFECTION

Prewar instructions for the prevention of ringworm were based on the use of chlorine, certain salts of which were thought to have potent fungistatic and fungicidal properties. Sodium thiosulfate had originally been used for footbaths but had not been proved efficient. In the Panama Canal Department, in fact, the commanding general had asked permission to discontinue its use.

Sodium thiosulfate was replaced by grade A calcium hypochlorite, which was used in solutions of 1 ounce of the dry chemical to each gallon of water, to yield 0.5 percent of available chlorine. The solutions were to be changed daily.

Early in 1942, when it became evident that high-test calcium hypochlorite was likely to become a critical material, The Quartermaster General inquired of The Surgeon General whether sodium hypochlorite could be substituted for it in the footbaths used to prevent fungus infections. Maj. (later Col.) William S. Stone, MC, Chief, Sanitation and Hygiene Branch and Laboratory Branch, Preventive Medicine Division, Office of the Surgeon General, replied that it could be substituted if the Quartermaster was prepared to handle a liquid product and if it was used in strengths sufficient to achieve and maintain a satisfactory concentration of chlorine. On 23 June 1942, with the publication of War Department Circular No. 261, the use of high-test calcium hypochlorite was restricted to water purification. On 27 July 1942, The Surgeon General informed the Commanding General, Army Ground Forces, that arrangements had been made with The Quartermaster General to supply sodium hypochlorite and standard bleach for disinfection of footbaths; both agents, it was stated, were satisfactory when they were used in sufficient concentration to produce not less than 50 p.p.m. of residual chlorine.

On 27 July 1943, Maj. Charles H. Miller, Jr., MC, Sanitation Branch, Preventive Medicine Division, Professional Services, Office of the Surgeon General, noted that, since the use of high-test calcium hypochlorite had been restricted, no definite policy had been laid down by the Preventive Medicine Division concerning a stock solution for footbaths. Major Miller suggested to Lt. Col. (later Col.) Arthur P. Long, MC, Acting Chief of the Sanitation Branch, that chlorinated lime be standardized for this purpose, since it was not a critical item, was easy to produce and ship, and was fairly stable.

On 17 August 1943, The Surgeon General recommended to the Commandant, Medical Field Service School, Carlisle Barracks, Pa., that solutions in footbaths be maintained at from 50 to 100 p.p.m. available chlorine, about one-fiftieth of the strength advised in FM 21–10, Military Sanitation and First Aid, and FM 8–40, Field Sanitation, which were then being revised. In the same letter, it was suggested that practical tests be carried out at the School to determine how frequently solutions in footbaths would have to be changed to maintain efficient concentration. It was further suggested that a routine of prevention be devised which would not be unduly burdensome.

The tests, which were carried out in the Department of Military Sanitation at the Medical Field Service School, were reported on 19 November 1943, by Maj. (later Lt. Col.) Cecil H. Connell, SnC, as follows:

1. Hypochlorite solutions require replenishment after 48 to 72 hours if the footbaths stand in the ordinary shower room without use.

2. Solutions which originally contain only 100 p.p.m. available chlorine must be replaced within an hour after they have been used by from 10 to 15 men. This requirement implies such close supervision as to make solutions in this strength impractical.

3. Even at an initial concentration of 1,000 p.p.m. available chlorine, no more than 40 to 50 men should use a footbath in a 24-hour period without replenishment of the solution.

4. Solutions must not be exposed either to direct sunlight or to bright diffuse sunlight.

5. Solutions of 1,000 p.p.m. available chlorine prepared from chloride of lime or sodium hypochlorite in water originally containing only 200 p.p.m. bicarbonate alkalinity are more stable than equivalent solutions prepared from grade A calcium hypochlorite. There is very little difference in the stability of solutions similarly prepared to provide 100 p.p.m. available chlorine. The use of higher concentrations, however, will raise the pH of the solutions to such a level that their fungicidal value will be affected.

Further studies directed toward the buffering of solutions were recommended. These studies were not carried out. On 4 January 1944, in reply to a request from the Office of the Surgeon General for a comment on this proposal, Dr. J. Gardner Hopkins (p. 90) stated that he did not consider the investigation warranted for the following reasons:

1. Latent infections were already so widespread among the troops that the value of attempting to prevent the transfer of infection from man to

man was highly questionable. Supposedly new infections were for the most part probably exacerbations of old latent infections.

2. The hypothesis that dermatophytosis is contracted in shower baths remained to be proved. The necessity of disinfecting the feet after the shower therefore was highly questionable.

3. The effectiveness of a footbath of satisfactory chlorine content at the proper hydrogen ion concentration was also unproved. Furthermore, it was completely impractical to suppose that soldiers would fulfill the necessary requirements for such baths, even if the method were effective.

4. While hypochlorite was highly effective in vitro against suspensions of fungus spores, it was apparently very ineffective clinically.

Dr. Hopkins suggested that, if such an experiment should be undertaken, the strongest and most potent disinfectant available be used for the studies. If it were found to reduce the incidence of dermatophytosis, a search could be conducted later for a cheaper substitute. He also suggested, realistically, that it might be well, since footbaths were apparently to be continued, to devise an inexpensive method of insuring that they contained more active chlorine.

CHANGING CONCEPTS

The Manual of Dermatology, prepared under the auspices of the Division of Medical Sciences, National Research Council, and published in 1942, which represented the consensus of dermatological opinion at the time, gave the first indication that the former theories of transmission and the former reliance upon disinfection of the feet were no longer fully acceptable.

Predisposing causes of dermatophytosis of the feet were listed as excessive sweating, circulatory instability or vascular disease of the extremities, long marches, the use of heavy shoes, prolonged wearing of shoes, and prolonged immersion of the feet. Both the incidence and the severity of the condition were stated to be greater in hot, moist climates.

Instructions for prophylaxis were substantially those already outlined, with the following three additional instructions:

1. Prophylaxis for the purpose of preventing transmission of fresh fungus infections was highly overrated. The crucial factor was individual susceptibility to infection. Some persons would acquire ringworm, no matter what the efforts to avoid it, and others would not acquire it despite repeated exposure.

2. The use of sodium hypochlorite or sodium thiosulfate footbaths near shower rooms was not always practical and was of doubtful value in preventing infections.

3. Sterilization of shoes by placing them in a closed container with a sponge soaked in formalin was of doubtful value and should be employed only if there was evidence of actual spread of contagion from man to man or if shoes which had been worn were reissued.

War Department Technical Manual, Guides to Therapy for Medical Officers, on the care of the feet, which was published on 20 March 1942, recommended disinfectant footbaths and formalin fumigation of presumably infected shoes. As late as May 1944, the same policies were still in effect.

In November 1944, the policy concerning the use of disinfectant footbaths began to change. In a note published in the *Bulletin of the U.S. Army Medical Department*, it was pointed out that hypochlorite footbaths had been adopted by the Medical Department, on the basis of early reports of their value, in 1931. Studies by Major Connell at the Medical Field Service School (p. 87) and by Dr. Hopkins and his associates at Fort Benning, Ga. (pp. 91–92) indicated that this method of disinfection was unlikely to be effective because of (1) the variable rates of decrease in concentration of effective fungicidal solutions, a property common to all solutions used in footbaths, and (2) the limitation of range of effective concentrations, a property common to chlorine solutions.

The note in the *Bulletin* also pointed out that—

1. Even if solutions used in footbaths killed all free spores present, a certain proportion would escape because they are encased in the keratin of epidermal scales.

2. Any solution which would dissolve keratin rapidly enough to kill the encased spores would also dissolve the horny layer of the sole and produce a severe dermatitis.

3. The keratin-encased spores are tracked onto floors adjacent to footbaths, subsequently become freed from the scales, sporulate, and, finally, serve as the main source of reinfection.

In view of these facts, it was suggested that the emphasis in prevention of dermatophytosis be transferred to mechanical methods of cleaning shower rooms and barracks floors by using water under pressure, scrubbing with brushes and detergents, and exposing duckboards and flooring, whenever practical, to direct, unfiltered sunlight.

In November 1944, in a revised memorandum issued by the Department of Military Sanitation, Medical Field Service School, and dealing with the control of athlete's foot, the article from the *Bulletin* which has just been cited was used as a reference. In this revision, as in the article in the *Bulletin*, the emphasis was placed upon mechanical methods of cleaning. Duckboards were not recommended unless floors were dirty or in poor repair; then alternate sets were to be used daily. Detailed directions were given for personal hygiene, cleanliness of clothing, disinfection of shoes by formalin, use of wooden sandals in barracks and shower rooms, use of issue foot powder, early medical treatment of abrasions and fissures, and frequent, careful foot inspections.

War Department Circular No. 146, issued 17 May 1945, directed that the use of footbaths be discontinued and placed the responsibility for the

prevention of athlete's foot upon careful personal hygiene and mechanical cleansing measures.

RESEARCH STUDIES

By July 1942, the importance of dermatophytosis in the expanding U.S. Army was so fully realized that a special research project on its prevention and treatment was undertaken by the Committee on Medical Research, Office of Scientific Research and Development, National Research Council.[2] This project was conducted under an Army contract with the College of Physicians and Surgeons, Columbia University. The principal investigator, Dr. Hopkins, Professor of Dermatology, had had a wide experience in clinical investigation, particularly in the fields of mycology and bacteriology. The use of Army personnel for the investigation was authorized at the Station Hospital, Fort Benning, Ga., by the Commanding General, Army Service Forces.

In the statement of the problem on 10 July 1942, it was pointed out that, although the various dermatoses of the feet which had come to be known as athlete's foot had existed in World War I, they had not been serious. They had also, sometimes in association with tinea cruris, been sources of considerable discomfort and disability in Panama and the Philippines, even before the war, and were likely to become major problems in the fighting in the Far East.

The subjects proposed for investigation were (1) the incidence of dermatoses of the feet, (2) the etiology of these dermatoses, especially the types of fungi and bacteria concerned, and (3) the development and testing of methods of treatment of these dermatoses as well as of fungus infections of the groin and trunk.[3] At this time, although considerable data were available on the new fungicides and antiseptics recommended for the prevention and treatment of these conditions, few reliable data were available on the results accomplished by these agents. It was thought that the studies would be most significant if they could be carried out on infantrymen on active duty in a hot climate, and, for that reason, Fort Benning was selected as a promising location for the investigation.

In his annual report for 1942–43 to the Committee on Medical Research, Office of Scientific Research and Development, National Research Council,

---

[2] In October 1942, the Council on Pharmacy and Chemistry of the American Medical Association took cognizance of the differences of opinion in this field by suggesting that several authorities be invited to prepare a report on the current status of fungicidal agents and to offer criteria to aid in their evaluation.

[3] A study of the fungi and bacteria concerned in dermatoses of the feet could scarcely have been undertaken during the war except as a research project. Even in civilian hospitals, dermatologists do not usually have available the services of personnel experienced in mycology, and diagnoses must often be made on clinical grounds alone, without laboratory confirmation. The same shortage existed in Army hospitals, and, in addition, the number of men suffering from dermatoses of the feet would have made laboratory studies entirely impractical even if facilities for such investigations had been available.

Dr. Hopkins summarized the concepts of prophylaxis current when the investigation was begun, as follows:

1. Prevention of infection is difficult to study in groups of men since most of them, including, probably, the most susceptible, are already infected. It may be an impractical aim in any group. If, however, prevention of infection is possible, it seems more hopeful to attack the parasite where its presence is known (that is, on the feet), rather than on floors and other objects which may or may not be contaminated. The efficacy of prophylactic footbaths has not yet been established, though heavy growths of nonpathogenic molds and bacteria have been recovered from hypochlorite footbaths after a few hours' use. Methods of sterilizing shoes, from which dermatophytes have been recovered, as well as floors must also be investigated.

2. Prevention of activation of latent cases seems, on present evidence, more practical than the prevention of infection. Hygienic measures include daily washing of the feet; careful drying, especially between the toes; removal of shoes and socks during rest periods, with elevation of the feet; and the use of wooden sandals or other open footgear in barracks, although no real evidence exists that there is danger in going barefoot.

The progress of the investigation is best described by summarizing the various progress reports made by Dr. Hopkins and his associates.

Report, 1 September 1943

In this report, data were presented derived from observations made on various techniques of prophylaxis.

Materials and methods.—Three companies (E, F, and G) of an infantry regiment were studied. A platoon of Company G served as the control group. The men of Companies E and F were examined once a month, though, for various reasons, chiefly training activities, furloughs, and transfers, it was never possible to examine an entire company or to follow the same group of men over the 4-month period of the investigation. From 65 to 148 men, or a mean of 101, from each company were available at each examination, and the percentages recorded were based on the actual number of men included at each examination.

Symptoms and signs were recorded. Any complaint of burning was classified as pain. Redness and desquamation of the toes varied only slightly from company to company and from month to month, as might be expected in a group of infantrymen observed under the same circumstances. Slides from toe webs and other suspected areas were examined for fungi.

Footbaths.—Footbaths of high-test calcium hypochlorite, in concentration to provide 50 p.p.m. of available chlorine, were used in the study of Company F. This company had shown a fairly uniform incidence of dermatophytosis in the 3 months preceding the study. During the period of study, there was no significant diminution in the number of men complaining of pain or itching or showing signs of intertrigo, and the proportion of fungi demonstrable in scrapings increased from 34 percent to 55 percent. The control company in the same battalion, which did not use footbaths, showed no significant change in the rate of dermatophytosis.

The absence of effect may have been due to failure of the men to follow instructions, but more probably, it was due to the following facts:

1. Disinfectant baths after showers would be unlikely to exert a notable effect in a group of men of whom 40 percent were already infected.

2. Hypochlorite deteriorates so rapidly that it is unlikely to be an effective disinfectant. Profuse growths of saprophytic fungi and bacteria were cultured from these baths after they had been in use a few hours.

Powder.—A powder containing 3 percent benzoic acid, 10 percent tannic acid, and 0.25 percent aerosol in talc was issued to all the men of Company E who were present at the first examination, whether or not they showed signs of mycosis. The objective was to treat incipient cases. This powder had been somewhat effective in relieving complaints and in causing the disappearance of fungi from scrapings when it was issued to men attending sick call. It had neither effect in this investigation, and it was concluded that it had not been used systematically.

Ointments and powders.—Company G was divided into four groups, one of which served as a control group while the other three were used to test the effects of treatment agents applied as ointment and powder. The objective was to treat carriers effectively and thus reduce the incidence of infection in the group as a whole. The attempt did not succeed, perhaps because infection was already so widespread, though another factor also had to be taken into consideration, that most of the men probably did not persist in treatment after their acute symptoms were relieved. Pain and itching were significantly reduced in the treated group, and some men became fungi-negative, but there was no lasting reduction in the percentage of infections, even in the treated group.

There were two conclusions from these initial studies:

1. The prophylactic effect of the treatment of carriers could be studied only if persistence of treatment could be enforced by military discipline.

2. Even if it could be enforced, it was doubtful that further spread of the infection could be prevented in groups which were already heavily infected.

Report, 18 January 1944

A memorandum to the Director, Infantry Board, Fort Benning, Ga., dated 18 January 1944, reported the results of the study on foot powders conducted between 18 October 1943 and 1 January 1944. The groups, as already mentioned, differed in size from time to time, but a total of 492 men were examined originally, 289 at the second examination, and 401 at the third.

The powders tested included benzoic acid powder in various formulas, undecylenic acid powder in various formulas, and 10 percent sodium propionate powder.[4] Two platoons used Government-issue powder, two talc

[4] The strongest undecylenic acid powder used (undecylenic acid-zinc undecylenate powder) contained 10 percent zinc undecylenate in talc. The present (1956) standard foot powder, fungicidal, stock number 6505–120–4045, contains either undecylenic acid 2 percent and zinc undecylenate 20 percent or calcium propionate 15 percent, zinc caprylate 5 percent, and zinc propionate 5 percent.

powder, and two no powder at all. All of the powders contributed to the comfort of some of the men, but none was superior to the Government-issue powder.

In evaluating this report, it was pointed out, the following three facts should be taken into consideration:

1. The tests were made in winter, when the incidence of dermatophytosis does not normally increase.

2. Precise scoring of the indefinite signs and symptoms of dermatophytosis is not possible.

3. A single microscopic examination for fungi is not conclusive, the error being at least 20 percent.

Publication, June 1944

Dr. Hopkins and his associates published the results of their studies at Fort Benning in the June 1944 issue of the *Bulletin of the U.S. Army Medical Department*. This paper contained a detailed discussion of the possibility that any fresh outbreak of dermatophytosis might mean either a new infection or a recrudescence of a latent infection. At this time, there was serious doubt that exogenous infection was an etiological factor of significance. Clinical evidence suggested that the incidence of dermatophytosis in troops was in the neighborhood of 80 percent. Surveys of various infantry organizations had shown incidences ranging from 52 to 78 percent. Microscopic evidence, which is notoriously unreliable on single examinations, had shown an incidence of 30 to 50 percent. The high carrier rate diminished the probability of success by any practical means of prevention of infection. The corollary was the prevention of activation; that is, the treatment of incipient and latent cases before they became active.

The following plan was proposed:

1. At monthly inspections, men should stand with their backs to the examining officer and raise each foot, so as to expose the sole and the toe webs.

2. Every man showing evidence of dermatophytosis should be given preparations for self-treatment, such as benzoic acid paint, salicylic acid and Merthiolate paint, or ISB (tincture iodine 7 percent, 15 cc.; salicylic acid 3 gm.; benzoic acid 6 gm.; camphor 10 gm.; and alcohol q.s. ad. 100 cc.) paint.

3. Each infected soldier should be required to report for reinspection until his feet were perfectly clear. Then he should be instructed to use one of the preparations just mentioned on his feet every week throughout the warm season, to prevent relapse. All the evidence favored the view that the patient's own feet are the source of infection, which flares up under the stress of hot weather, heavy shoes, and violent exercise.

4. Since infection from floors, baths, and laundries, and reinfection from shoes, socks, and similar sources of infection, had not yet been definitely excluded, disinfection of floors and showers, protection of the feet by wooden

sandals, and the application of one of the fungicides just listed was recommended, especially among recruits.

Earlier, Dr. Hopkins had reported that the powder issued through supply channels did not seem to be extensively used. Both medical and line officers were apparently under the impression that it should be used only in active cases, in which it seemed to have little value. Important principles of prevention were (1) to make the diagnosis of dermatophytosis at inspection rather than sick call; (2) to differentiate dermatophytosis from other dermatoses of the feet; (3) to begin treatment promptly and to persist in it without interruption as long as there was evidence of infection and for a considerable time thereafter, especially during warm weather; (4) to use weak, nonirritating agents, for their fungistatic rather than fungicidal effect, and to keep the skin continuously under their influence; (5) to individualize the treatment of severe, recalcitrant cases; and (6) to utilize all possible hygienic measures. The adherence to these principles was more important than the use of any single agent.

Report, 15 July 1944

In a report dated 15 July 1944, Dr. Hopkins pointed out again that efforts to prevent contagion had not proved effective in the tests carried out at Fort Benning and that efforts to prevent activation by systematic treatment of latent or incipient cases had also met with no demonstrable success, probably because of lack of cooperation by the soldiers involved in the experiment.

The high incidence of dermatophytosis was considered to be caused by damage of the stratum corneum by violent exercise in hot weather in heavy shoes. The application of various substances, especially lecithin and carnauba wax, apparently hardens the skin surface and increases its water repellency, and efforts in this direction were being continued, though no clear-cut prophylactic effects had yet been accomplished. Improvement of foot hygiene was believed to hold the most promise.

It was recommended that ineffectual attempts to prevent contagion should be abandoned and that efforts be directed toward improved foot hygiene and persistent treatment of latent and incipient cases, since the prevention of contagion was apparently entirely impractical. At a conference on fungus infections of the skin held by the Division of Medical Sciences, National Research Council, acting for the Committee on Medical Research, Office of Scientific Research and Development, 20 June 1944, Dr. Hopkins had made a report on the investigation at Fort Benning, and the conference had concluded that footbaths were neither effective nor necessary and had recommended that their use be discontinued.

Report, 31 December 1945

In his report of 31 December 1945, Dr. Hopkins reiterated the importance of latent or subclinical dermatophytoses; the ineffectiveness of footbaths; the

failure of attempts to free the feet of fungi by prolonged treatment after signs and symptoms had disappeared; and the fact that there were only two hopeful methods of prophylaxis, the constant use of suppressive measures and the improvement of the physiologic condition of the skin.

Powders were regarded as the most practical agents for suppressive treatment because of their safety in packing and their ease of application. None of the agents tested showed any advantage over the Government-issue powder already in use. On the other hand, most of the undecylenic acid powders used in the tests contained only 2 percent zinc undecylenate. A small group of patients treated with an undecylenic acid powder with a 10 percent content showed a slightly reduced incidence of mycoses. Attention was called to the report by Sulzberger and his associates (pp. 96–97) which showed that powders containing 18 percent zinc undecylenate and 2 percent undecylenic acid were definitely effective.

Report of Council on Pharmacy and Chemistry, American Medical Association

In a report of the Council on Pharmacy and Chemistry, American Medical Association, issued in July 1945 and participated in by Dr. Hopkins, the following conclusions had been reached:

1. Evidence from the laboratory does not settle the question of recurrence versus reinfection. Some observers have cultured fungi from apparently normal feet, while others have failed. All dermatologists are agreed that fungi can remain for long periods within diseased nails without provoking an inflammatory reaction. The nails thus constitute an innocent-looking reservoir of infection. Fungi are known to have lived as long as 433 days in dry scales, which suggest that at least some attacks are to be explained by reinfection.

2. Because fungi have been isolated from shoes, clothing, floors, and similar objects, the role of reinfection cannot be disregarded.

3. Some observers believe that the solution of the problem lies in the species of fungus concerned. *Epidermophyton inguinale* infections are readily cured; a second attack must be a reinfection. *Trichophyton purpureum* infections are extremely resistant to treatment; a second attack is likely to be a recurrence. Succeeding attacks of *Trichophyton interdigitale* infection may be either a reinfection or a recurrence. The corollary of these observations is that prophylaxis should have two objectives, to destroy the fungi on the skin completely and to destroy them in shoes and other environmental locations.

4. Footbaths are of no value. Good results reported from their use probably fail to take into account the increased attention to foot hygiene which follows attention to the subject.

U.S. NAVY STUDIES

Two studies conducted under the auspices of the Research Division, Bureau of Medicine and Surgery, U.S. Navy, on the effectiveness of certain preparations in the prophylaxis and treatment of fungus infections of the feet and groin are pertinent in this connection.

The first of these studies, which was conducted between September and December 1944, involved a total of 808 prisoner volunteers at the U.S. Naval Disciplinary Barracks, Hart's Island, N.Y. The circumstances of the test were highly favorable because the subjects could be kept under precise and uninterrupted observation.

Each foot of each subject was regarded as a separate test object, and it was thus possible to make a direct comparison of the effect of two measures employed in the same individual without regard to such variable factors as differences in individual susceptibility to infection, intensity of exposure, reaction to infection, and tendency to spontaneous recovery. Powdered preparations were used exclusively because they were easy and safe to carry about and store, they were stable, and they were convenient to use and apply. A powder also has the additional advantage of absorbing moisture from the skin surfaces of the areas in which fungi usually thrive.

Active fungus infections developed in personnel tested as follows: In 23 (8.85 percent) of 260 men who had no treatment at all; in 7 (8.33 percent) of 84 men who wore an impregnated sock on one foot; in 28 (11.16 percent) of 251 men who used a boric acid-salicylic acid powder on one foot; in 8 (3.10 percent) of 258 men who used propionate powder on one foot; and in 3 (1.07 percent) of 281 men who used undecylenic acid-undecylenate powder on one foot.

These observations suggested that the use of both propionate powder and undecylenic acid powder afforded some degree of protection against fungus infections, with the latter agent somewhat more effective. The results, perhaps inconclusive in themselves, were supported by the results of therapeutic studies which indicated corresponding trends for each of the agents studied. Essentially the same results were apparent when tests were carried out with these agents during the continuous wearing of shoes over a 7-day period.

The second Navy study was an investigation of the feet under field conditions in Florida, from March 1945, the beginning of the hot season, until the latter part of August. The study was conducted by the paired-foot technique and with test ointments as well as powders. The results were as follows:

Of 4,720 unselected men examined at the beginning of the study, 1,124 (23.8 percent) had clinical evidence of fungus infection of the feet, and 201 (4.26 percent) had clinical evidence of fungus infection of the groin.

Of 4,194 men free from infection at the beginning of the investigation, active fungus infections of the feet were acquired during the 8-week period of training by (1) 387 (28.0 percent) of 1,384 men who formed a control

group and received no treatment, (2) 20 (14.8 percent) of 135 men who used sodium propionate powder, (3) 64 (7.9 percent) of 814 men who used calcium-zinc propionate powder, (4) 98 (15.1 percent) of 648 men who used boric acid-salicylic acid powder, (5) 48 (4.0 percent) of 1,213 men who used undecylenic acid powder.

In the study of prophylactic measures in infections of the groin, of 4,785 men free of infection at the beginning of the study, active infections were acquired during the training period by (1) 164 (10.3 percent) of 1,598 men who formed a control group and received no treatment, (2) 24 (2.9 percent) of 815 men who used calcium-zinc propionate powder, (3) 31 (4.2 percent) of 731 men who used boric acid-salicylic acid powder, (4) 10 (0.7 percent) of 1,450 men who used undecylenic acid powder.

In both of these tests, undecylenic acid powder showed significant superiority to all other fungistatic agents tested.[5] From the therapeutic standpoint, all agents showed effectiveness, with undecylenic acid powder significantly superior. In the treatment of the more severe infections of the groin and feet, undecylenic acid ointment was significantly superior to propionic acid ointment.

FOOTGEAR STUDIES

Studies on prophylaxis of dermatophytosis which were concerned with footgear had two objectives, the sterilization of presumably infected footgear and the use of special types.

Sterilization of Footgear

Formaldehyde (formalin) had been recommended for sterilization of shoes in the prewar instructions for the prevention of dermatophytosis (p. 89). The authors of the Manual of Dermatology (Drs. Pillsbury, Sulzberger, and Livingood) questioned the usefulness of this method (p. 88).

At a conference on dermatophytosis held by the Division of Medical Sciences, National Research Council, acting for the Committee on Medical Research, Office of Scientific Research and Development, on 8 November 1943, considerable attention was devoted to this subject. In a report on methods of sterilization of shoes being repaired for reissue, it was stated that the use of neither chlorine nor formaldehyde gas had proved satisfactory for this purpose. Tests then in progress showed that formaldehyde in solution, while

[5] At a conference on dermatophytosis, called at the request of Maj. Gen. Norman T. Kirk, The Surgeon General, on 11 April 1946, by the Division of Medical Sciences, National Research Council, acting for the Committee on Medical Research, Office of Scientific Research and Development, the following recommendations were adopted: (1) The Army should adopt the standard Navy preparation of zinc undecylenate and undecylenic acid as standard-issue foot powder. No certainty was felt that this powder would solve the problem of prophylaxis, but it was regarded as the preferable fungistatic agent at the time. (2) This powder should be considered only as an adjuvant to other measures of foot hygiene, which should be energetically encouraged and strengthened. The prolonged use of the powder was to be particularly stressed for men with recurrent infections and those recovering from acute attacks. (3) The sale of foot powders in post exchanges should be discouraged, so that the powder recommended would be used uniformly.

it did not insure complete destruction of pathogens, was somewhat more satisfactory. A search was under way for an antiseptic or germicide with which shoe leather could be impregnated to inhibit and, preferably, to kill pathogens during the life of the shoe.

An evaluation of various disinfectants for this purpose, conducted by the Office of the Quartermaster General, showed that pieces of leather could be effectively sterilized with formaldehyde vapor, though the effectiveness of the agent was influenced by the amount of moisture in the atmosphere. The gas was also slow to penetrate cracks and crevices in shoes. Formaldehyde solution had proved consistently effective on dirty shoes inoculated with a medium containing a suspension of spores incubated to establish growth. The use of the solution was followed by the application of a solution of sodium bisulfite, to neutralize all free formaldehyde, and then by a bath in a solution of 0.5 percent pentachlorophenol in oil and water. This method, which had the approval of The Surgeon General, was to be instituted at two shoe-rebuilding plants within the next few weeks.

It was agreed that these studies should be continued, since investigation of penitentiary personnel had showed that the use of chemically treated shoes had reduced the incidence of infection materially. At the conference on fungus infections held on 20 June 1944, it was also concluded that shoe sterilization was desirable until further information was available concerning factory-rebuilt shoes. Shoes turned in for exchange, which did not require repair, were not to be sterilized, since available evidence did not indicate that footgear in this condition transmitted fungus infections. In an article in the *Journal of the American Medical Association* for 14 July 1945, techniques of disinfecting previously worn shoes with formaldehyde were described for both small lots and large numbers.

Special Types of Footgear

Clogs.—Clogs were employed in a number of installations, but never officially. In July 1943, a representative of The Surgeon General stated that reports from whole units provided with clogs for use in shower rooms had been very favorable. In the March 1945 issue of the *Bulletin of the U.S. Army Medical Department*, details were given for their construction from salvaged material available at any camp.

Sandals.—There is no doubt that aeration is essential in the hygiene of the feet and that the heavy, impermeable footgear of the infantryman, particularly when it is worn in hot climates, influences the incidence of mycoses. A preliminary study of the use of open-toed sandals at Eglin Field, Fla., in May 1944, produced such good results in the 20 subjects of the test that the Air Surgeon requested the Army Air Forces Proving Ground Command to conduct a similar test on a larger scale. The request was prompted by the fact that 30 percent of the patients treated in the Eglin Field dispensary between May and October the previous year had come because of foot infections.

A well-controlled test was therefore carried out for a 2-month period on 900 control personnel and 1,200 experimental personnel. The experimental group wore sandals which had leather soles and uppers and rubber heels, usually without socks. The control group wore the regular Army footgear.

Of the 2,100 men examined during the week ending 15 May 1944, at the beginning of the study, only 19 percent showed no visible evidence of infection, and 23 percent had infections severe enough to be of medical concern. At the end of the 2-month period of testing, only 3.5 percent of the men who wore sandals had evident infections, and in most of them the disease was of no great medical concern. The men, for the most part, liked the sandals. Only one instance of trauma which might have been prevented by wearing service shoes occurred during the test.

Among the group wearing regular-issue shoes, 28 percent had severe infections. Sixteen men from the control group had to be hospitalized for infections of the feet during the test period, as against only one man from the experimental group; 208 days of hospitalization were charged to the 900 men in the control group, as against only 13 days to the 1,200 men wearing sandals. Many men whose feet had improved while they were wearing sandals had serious infections again when they resumed wearing Army shoes.

The results of this experiment suggested that it would be quite feasible to eliminate dermatophytoses completely from an organization by the use of sandals, the exercise of foot hygiene, and a certain amount of medical treatment.

How practical the general use of sandals would be was, of course, another matter. They are not practical for combat troops, for marching, or in terrain infested either by mosquitoes or by hookworm larvae.[6]

As a result of the experiment at the Army Air Forces Proving Ground at Eglin Field, a recommendation was sent to The Quartermaster General on 24 April 1945 by Brig. Gen. Charles R. Glenn, Deputy Air Surgeon, that a satisfactory type of sandal be developed for issue to troops under certain specified conditions. The Eglin Field experiment and Dr. Hopkins' evaluation of it were cited in support of this recommendation. The recommendation was endorsed by Brig. Gen. James S. Simmons, MC, Director, Preventive Medicine Service, Office of the Surgeon General, on 4 May 1945, but the sandal suggested had not yet been developed when the war in the Pacific ended 3 months later.

Studies on the use of sandals in the Pacific theater are described under that heading (p. 104).

Jungle boots.—In June and July 1944, at the request of Maj. (later Lt. Col.) John C. Brinsmead, Infantry Board, Fort Benning, Dr. Hopkins and

---

[6] At the conference on dermatophytosis held on 11 April 1946 (p. 97), it was recommended that personnel working in warm climates should wear sandals whenever feasible and that they should be issued to all troops who could wear them without danger of infection or interference with duty. It was further recommended that a study should be made of the extent to which sandals could be worn in the Army.

his associates participated in a test with fabric-top jungle boots, to determine the effects of aeration of the feet. Three types of boots were used: Type A, with leather sole and canvas vamp and upper; type B, with leather sole and canvas upper; and type C, regulation jungle boot. Four groups, each consisting of 20 men, participated in the test. Twenty men wore type A boot, 20 men type B, and 20 men type C. The fourth group wore type A boot on one foot and type B boot on the other. The test groups, carrying full field equipment, marched through swamps for several hours each day, their feet being dry only when their shoes were removed at night. The feet were examined when the shoes were issued and at 5-day intervals during the 30 days of the test.

The test did not prove conclusive, one reason being that no control group wore regular-issue combat shoes. No outstanding prophylactic or curative effects followed the use of any type of boot worn, and none of the changes in the feet could be attributed solely to the footgear used. Any curative or prophylactic effect due to aeration was masked by the constant immersion, which, curiously, seemed to have some beneficial effect, although it provided the very conditions usually considered favorable for the growth of fungi. The effect of jungle boots on dermatophytosis under dry conditions was not determined.

A similar study conducted by the Navy during field training at Camp LeJeune, N.C., was reported in October 1944. The test, which was designed to evaluate a special tropical boot with nylon uppers, was carried out on 200 men, half of whom wore these boots while the other half wore the standard Marine Corps field shoes and leggings. Each man went through a rigorous 6-week training period, which included marching and amphibious landings. The feet were examined weekly. At the end of the field trials, the feet of the men who wore the experimental boots were in better condition, with much less maceration and scaling, than the feet of the men who wore the standard Marine Corps boots. The experimental boots were also in better condition than the standard boots.

FUNGUS INFECTIONS IN SPECIAL AREAS

Caribbean Defense Command

In the Canal Zone, where the heat is constant and the humidity is high, dermatophytosis, as might have been expected, was the outstanding dermatological problem among both military and civilian dispensary patients. During the year ending on 30 June 1944, 28 percent of the new patients seen in the dermatology clinic at the Gorgas Hospital, Canal Zone, had tinea infection as the basis of their chief complaints, and 34 percent of the dermatological patients admitted to the hospital had dermatophytosis. The percentages would have been even more impressive if they had been calculated on the total number of clinic visits and the total number of hospital-stay days. It

was just as important in the Canal Zone that all medical officers, regardless of their special field, be familiar with the clinical appearance and practical management of fungus infections as it was that medical officers in the Pacific be aware of malaria.

Preventive measures, which applied to the whole Caribbean Defense Command, began with the provision of hot running water at all barracks at permanent posts, camps, and bases. Adequate supplies of fresh water were maintained at all outlying installations and positions except at Salinas, Ecuador, and Seymour Island, Galapagos Islands, where salt-water showers were provided. Two sets of duckboards were provided for each shower; they were used on alternate days, so that the set not in use could be sunned. Disinfectant footbaths proved as unsatisfactory in the tropics as elsewhere in the prevention of fungus infections of the feet.

The most important preventive measure was careful personal hygiene. All personnel were thoroughly instructed in such matters as daily baths, with careful drying, with a clean towel, especially of the interdigital spaces, the armpits, and the groin; frequent changes of underclothing; and boiling of clothing worn next to the body. The care of his clothing was a responsibility of the soldier himself; many cases of epidermophytosis had been traced to the wearing of soiled, perspiration-soggy clothing, especially fatigue uniforms.

Special attention was given to the feet. Instructions were to wash them twice daily, with soap and warm water, then to apply powder freely, especially between the toes. Ordinary borated talcum powder was extremely satisfactory, but the kind of powder used was not as important as its frequent, regular application. The use of an astringent on the feet, such as rubbing alcohol, was also thought to be a useful preventive measure.

Cotton socks were preferable to woolen socks. Instructions were to change them daily and, if the feet perspired excessively, twice daily. It was recommended that, whenever practical, perforated shoes and open sandals, which permit free ventilation, should be used.

European Theater of Operations

As early as 3 April 1943, the question of fungus infections of the feet was discussed in the European Theater of Operations. On that date, Lt. Col. (later Col.) Donald M. Pillsbury, MC, Senior Consultant in Dermatology, Office of the Chief Surgeon, ETOUSA (European Theater of Operations), expressed the opinion that footbaths in shower rooms were unnecessary because (1) their effectiveness was in question, (2) soldiers would avoid using them whenever they could, (3) the incidence of fungus infections of the feet was low, and (4) proper foot hygiene and the use of foot powder would be sufficient to prevent such infections.

On 10 June 1943, Colonel Pillsbury visited Depot G–25 with Maj. (later Col.) Ralph R. Cleland, SnC, to study the incidence of ringworm infection in this service installation. The men on this post were doing exceptionally

heavy work in depots, machine shops, and on construction jobs, and the proportion doing sedentary work was low. The men wore regular-issue shoes, many of which had rubber soles, with very heavy British-issue socks. Recommendations were made for frequent changes of socks; regular use of issue foot powder; bathing the feet daily during warm weather and drying them well; regular, careful cleaning of showers; sterilization of Red Cross hospital slippers with formalin vapor or methyl bromide; and regular inspections of the feet. It was also recommended that an investigation be made to determine whether or not the use of rubber-soled shoes was increasing the incidence of fungus infection and that the situation be checked at intervals from the Office of the Chief Surgeon, Headquarters, ETOUSA.

On 27 July 1943, Colonel Pillsbury reported to the Chief Surgeon that a study of 2,257 men in Eastern, Western, and Southern Base Sections showed that only 20 percent had entirely normal feet. Forty percent had slight inflammatory changes, which for the most part could not be classified as true ringworm, and 30 percent had moderate to severe fungus infections. The latter group served as definite potential sources of infectiveness. British-issue socks and rubber-soled shoes were thought to be responsible for a fair number of these cases. Not more than a quarter of the men questioned used foot powder regularly, because of individual laxity, failure of noncommissioned officers to emphasize the importance of foot hygiene, and occasional inadequate supplies. Hypochlorite footbaths had been of no apparent value in preventing fungus infections.[7]

Recommendations to improve this situation included discontinuance of footbaths, increased emphasis on foot hygiene, discarding of British-issue socks by men who showed any signs of inflammatory skin changes, and mechanical cleaning of shower rooms. Attention was called to Medical Bulletin 9, September 1943, Office of the Chief Surgeon, Headquarters, ETOUSA, which described the types of socks available in the theater and directed that medical officers familiarize themselves with them and recommend the use of the proper socks for special types of work and weather.

On 6 March 1944, Circular Letter No. 34, Office of the Chief Surgeon, Headquarters, ETOUSA, stated that too many patients with complications of simple skin diseases were being hospitalized and that the load of admissions must be decreased. Fungus infections of the feet, it was pointed out, could be prevented by frequent washing, careful drying, regular use of foot powder, the use of proper socks, frequent changes of socks, immediate attention to superficial lesions, and careful examination of the feet at inspections. Overtreatment, it was stated, was responsible for more disability than any single skin disease.

The Manual of Therapy published in the European theater in May 1944, just before the invasion of the Continent, outlined the care of acute infections

[7] Informal Routing Slip, Lt. Col. Donald M. Pillsbury, MC, Senior Consultant in Dermatology, Office of the Chief Surgeon, ETOUSA, to Chief Surgeon, ETOUSA, 27 July 1943, subject: Fungous Infections of Feet in ETO.

of the feet and recommended, in the chronic phase, the personal measures of foot hygiene which have already been described.[8]

On 19 June 1944, in response to a request from the Division of Medical Sciences, National Research Council, for a statement on fungus infections of the skin which could be read at a forthcoming conference (p. 97), Colonel Pillsbury wrote as follows:

1. Fungus infections of the feet had not proved as great a problem in the European theater as in the Zone of Interior or in tropical theaters, probably because of the cooler environment. Local outbreaks could usually be traced to improper footgear or poor foot hygiene.

2. Fungus infections of the groin were common but were seldom disabling unless they had been complicated by overtreatment or by chronic follicular infections.

3. All inflammatory eruptions of the hands and feet were likely to be diagnosed originally as fungus infections. Actually, only about 50 percent of these eruptions were of fungus origin, while in some cases the underlying fungus infection was obscured by pyoderma, reactions to treatment, or a contact dermatitis.

4. Prophylactic measures were entirely practical. They included personal cleanliness, careful drying of the feet, and regular use of foot powder. Footbaths were of no value, and soldiers did not use them unless they were forced to.

5. Almost all acute attacks were caused by increased growth of the fungi which were old and respected members of the individual's own skin flora. A patient who had sustained two or three acute attacks of a fungus infection was never again the same, dermatologically speaking, especially if there had been a pyogenic complication.

After outlining the methods of management used in fungus infections, Colonel Pillsbury concluded with the statement that fungicides then available hardly deserved the name. The solution of the problem as it then existed, he said, was (1) to disseminate knowledge concerning the intelligent use of well-tested compounds which did as little harm as possible and (2) to lend every encouragement to studies which would yield basic information. He did not consider the comparison of the effects of various preparations as yielding the desired information.

Additional memorandums and circular letters issued in the theater and personal instruction all reiterated that the prevention of fungus infections depended upon careful foot hygiene and that footbaths should not be used in the hope of preventing them.

Several observers in the European theater believed that there was a correlation between the presence of fungus infections and the development of trenchfoot, but this was not a generally accepted theory.

Southwest Pacific Area

As late as July 1945, Brig. Gen. (later Maj. Gen.) Guy B. Denit, Chief Surgeon, U.S. Army Forces, Pacific, stated that dermatoses remained one of the greatest single problems of hospital admissions and evacuations in the Pacific. In one evacuation hospital, skin conditions constituted 54.8 percent

[8] Manual of Therapy, European Theater of Operations, 5 May 1944.

of the evacuations for general medical causes; they were chiefly chronic eczematoid lesions superimposed on epidermophytoses and trichophytoses.

In September 1944, Dr. Hopkins, acting as Technical Observer, Office of Field Service, Office of Scientific Research and Development, began an extensive tour of the medical installations in the SWPA (Southwest Pacific Area) to study dermatoses, particularly dermatoses of fungus origin. His tour extended from Brisbane, Australia, to Leyte, Philippine Islands, and included general and station hospitals, outpatient dispensaries, and battalion aid stations. Time did not permit microscopic or cultural studies, and statistical evidence concerning the incidence of dermatoses could not be secured because of lack of knowledge of the numbers of troops from which hospitalized patients were derived.

Dr. Hopkins' report to General Denit, dated 13 March 1945, contained the following observations:

Dermatophytosis of the feet was the cause of much discomfort, but in rear areas it was seldom disabling. In base and station hospitals well removed from the front, the incidence of intertrigo of the toes on dermatological wards was lower than would be found in a group of healthy soldiers on active duty. In base dispensaries, fungus infections of the feet were more frequent, but no more frequent than in military dispensaries in the Zone of Interior. In battalion and regimental aid stations for troops actually in combat and in clearing companies directly to the rear, these infections were frequent and were often severe. The shoes could not be removed for days at a time in the frontline, and there was little opportunity to care for the feet, with the result that there was apparently a significant amount of complete disability.

In most of the cases diagnosed as epidermophytosis, no fungi could be demonstrated. In only a few cases did it seem reasonable to assume that the eruptions had originally been of fungus origin and then had become secondarily infected, though the possibility, of course, could not be positively excluded in many cases.

As in the Zone of Interior, few attacks seemed to be caused by external infection or reinfection from shoes or clothing. Most of the patients brought their infections with them in latent form, and they flared up under the difficult climatic conditions. The routine use of a mild fungicide, such as the Government-issue foot powder, was a more effective prophylactic measure than hypochlorite baths or disinfection of shoes, socks, and shower-room floors. Powder was more convenient to use than ointments.

Dr. Hopkins considered that the wearing of sandals would be an excellent preventive measure. He suggested that sandals might be issued and permission given to wear them during hours and in areas defined by the surgeon of each organization. They should have thick soles and toe guards, so that their use would not interfere with the programs for the control of malaria and hookworm.

The incidence of tinea cruris was high, especially among troops in active training or in combat. It was conceivable that the disease handicapped the men in the performance of their duties, though only occasionally did it cause complete disability or require hospitalization.

Tinea corporis was frequent and often involved the arms and legs also. It was sometimes severe enough to require hospitalization. In almost every hospital visited, there were 3 or 4 patients with generalized ringworm among every 100 or 200 dermatological patients. These infections were no more severe, and probably no more numerous, than those encountered at Fort Benning in August and September, but in the Pacific they were perennial. The etiological factor was unevaporated sweat, which was due, in turn, to the wearing of clothing in hot, humid weather. In U.S. troops, the eruption was often encountered in a band about the belt and over the buttocks, where the clothing was thickest. Like tinea cruris, tinea corporis was often refractory to treatment.

An interesting experiment had been conducted in the Pacific by the 43d Infantry Division while it was in a rest area. Three hundred men with unclassified skin diseases, a large number of whom presumably had fungus infections, were kept on the beach for 4 hours daily without either clothing or shoes. They were free to bathe, lie in the sun, or exercise as they chose. In 80 to 90 percent of these cases, the skin conditions cleared up with no other treatment. The obvious curative factor was evaporation of perspiration and the keeping of the skin as dry as possible. Direct exposure to the sun possibly had an added sterilizing or tonic effect. Dr. Hopkins recommended that permission for the men to go naked to the waist during the sunny hours of the day might be a good preventive practice, which would not militate against the antimalarial program. A change in the fabric of the Army shirt and the use of some more loosely woven fabric, such as was used in the Australian Army shirt, was another possibility.

Observations in the SWPA suggested a possible individual immunity to dermatophytosis. In any platoon or company, perhaps 10 percent of the men would never have any indication of the disease although they mingled freely with infected men and usually employed no prophylactic measures. The cause of this apparent immunity was unknown, and it was Dr. Hopkins' opinion that a study of it might be rewarding.

An interesting part of Dr. Hopkins' report concerned the group of men who, after the Leyte landings, stood, marched, and slept for long periods in flooded rice paddies without removing their shoes. A significant amount of temporary total disability developed, and many of the men had to be carried out when evacuation became possible. This episode was reported to Dr. Hopkins by Maj. James R. Webster, MC, at the 54th General Hospital near Humboldt Bay, Dutch New Guinea, which received many of these casualties. During the acute stage, Major Webster stated, no fungi could be found in the

559625v—61——9

lesions, which suggested that the condition was essentially bacterial. The fact that in many instances fungi could be demonstrated after acute symptoms had subsided suggested that, in at least some of these cases, the bacterial infection was secondary to a fungus infection and that the essential pathogenic factor was maceration of the stratum corneum by prolonged immersion. Dr. Hopkins agreed with Major Webster that it was unfortunate that some of these patients had been evacuated with the diagnosis of immersion foot.[9]

On the ground that greasing the feet had proved a useful preventive measure in the trench warfare in Europe in 1918, an experiment was set up, under the direction of Maj. (later Lt. Col.) John J. Mohrman, MC, Surgeon, 43d Infantry Division, before the Luzon landings. One group of men greased their feet with petrolatum, another with liquid petrolatum, and still another with a fatty acid ointment.

Since the Luzon landings were made on dry terrain, the chief purpose of the experiment was defeated, but a few useful facts were determined. Sixteen enlisted personnel of the 56th Portable Surgical Hospital, who applied foot powder to one foot and liquid petrolatum to the other, had no pronounced discomfort and no visible damage to the skin during the landings, although the heat was extreme. Similar results were evident in another group of 16 men from the same installation who applied foot powder to one foot and undecylenic acid ointment to the other. Most of the men in both groups preferred the powder, but a few thought that oiling had kept them more comfortable. These observations were regarded as sufficient to show that it would be entirely safe to oil the feet prophylactically in future landings on terrain expected to be flooded, in the expectation that the number and severity of the skin infections and other conditions encountered after the Leyte landings might be diminished.

SUMMARY

Since much of the fighting in World War II, as well as much of the training, took place in warm or tropical climates, the dermatophytoses became extremely important, and research in this field received additional emphasis. As a result of practical experience and research studies, concepts changed. The role of bacteria assumed greater importance in the etiology of the infectious intertrigoes once considered to be caused entirely by fungi. Opinion regarding repeated attacks of dermatophytosis swung away from the older

[9] Patients with the same signs and symptoms who were admitted to the 36th Evacuation Hospital, Palo, Leyte, and the 58th Evacuation Hospital, Tacloban, Leyte, after the Leyte landings were considered to be suffering from a form of cold injury, low on the gradient and caused by wetness. These patients were studied within 12 hours of their arrival by Maj. (later Lt. Col.) Frank Glenn, MC, Consultant in Surgery, Office of the Surgeon, Sixth U.S. Army. Although there was no evidence of peripheral vascular changes in the cases observed at the 54th General Hospital, observations at the 36th and 58th Evacuation Hospitals included discoloration of the feet and extreme pain, which prevented rest and which was very difficult to relieve. The condition at both of these evacuation hospitals was transitory, and recovery was prompt. It is entirely possible that the differences in evaluation of the condition arose from the time at which the patients were seen; in wartime, patients are normally hospitalized in evacuation hospitals prior to transfer and admission to general hospitals.—J. B. C., Jr.

concept of reinfection to the newer one of relapse brought about by violent exercise, the wearing of impervious shoes, unevaporated sweat, and maceration of the skin.[10]

The acceptance of these theories meant that many of the measures of prevention which were commonly used before the war and in the first years of fighting were not only ineffective but were also potentially harmful. Footbaths in the prophylaxis of dermatophytosis fell into disrepute. Emphasis was placed upon strict attention to foot hygiene, with measures to keep the feet clean and dry. These measures included the use of perforated shoes or sandals, when practical; the use of socks capable of absorbing moisture; and the regular use of a drying, mildly fungistatic foot powder. Undecylenic acid and zinc undecylenate, which were developed during the course of the war, proved more effective fungistatic agents than any previously available and had the additional advantage of not causing irritation.

FRANKLIN H. GRAUER,
Colonel, MC, USA.

Part II. Impetigo

The situation relating to impetigo at the beginning of World War II differed little from that in World War I, and the actual experience with the disease did not differ materially from that in civilian medical practice, with the exception of experience in the tropics and advances in treatment with antibiotic drugs. The question of its epidemiology is still unsettled. There is no proof as to whether *Staphylococcus aureus* or *Streptococcus hemolyticus* is the primary or causative organism, and when cultures have been made of impetiginous lesions the results have only served to becloud the issue. Preventive measures are still considered to be personal hygiene, cleanliness, sanitation, and education. The disease was never a serious military problem. The occurrence varied from theater to theater, being somewhat more frequent and important in the tropics.

Military reports and publications deal with old, or widely accepted, knowledge. The only new scientific facts or discoveries have to do with the use of sulfanilamide and other sulfa derivatives, locally or orally, and with penicillin preparations, locally or parenterally.

---

[10] Studies since the war have added convincing experimental evidence to previous clinical data that exogenous exposure to fungi in swimming pools, showers, bathrooms, and similar areas plays a minor role, if any role at all, in precipitating acute attacks of fungus infections of the feet. Attempts by Baer and his associates to induce either acute attacks or some evidence of clinical fungus disease of the feet in 45 subjects mycologically free of disease by deliberately exposing them to masses of pathogenic fungi in footbaths were entirely unsuccessful. (Baer, L., Rosenthal, S. A., Rogachefsky, H., and Litt, J. Z.: Newer Studies on the Epidemiology of Fungous Infections of the Feet. Am. J. Pub. Health 45: 784–790, June 1955.) Not a single instance occurred within 6 weeks after exposure, although during this time fungi were found one or more times on the feet of 60 percent of the exposed subjects. This is further proof that it is the decreased resistance of the skin of the human host, with resultant activation of pathogenic fungi previously lying dormant as opportunists on the patients' own feet, which is usually responsible for such attacks.

INCIDENCE

The conclusion that impetigo contagiosa was not frequently encountered and that the incidence was so low that the disease never seriously threatened or disturbed the effectiveness of command may justifiably be drawn.

The average number of days lost per admission for the years 1942, 1943, and 1945 was 12. The noneffective rate for the 4 years 1942 to 1945, inclusive, was 0.04 per 1,000 average strength.

Incidence data were available for the years 1944 and 1945 only. These figures are for both primary and secondary diagnosis. There was a total of 29,611 cases for the 2 years, of which 5,935 were in the continental United States and 23,676 outside continental United States. The average rate per annum, per 1,000 average strength, was 1.93 for all theaters and areas; 0.86 for continental United States; 2.80 for oversea areas; 1.41 for the European theater; 2.69 for the Mediterranean theater; 1.64 for the Middle East; 4.29 for CBI (China-Burma-India theater); 6.64 for SWPA; 3.14 for the Central and South Pacific Area; 0.51 for North America; and 0.89 for Latin America.

Pacific areas.—From the figures in table 9, it is clearly seen that impetigo presented a more serious problem in tropical than in temperate climates. A report from the South Pacific Base Command, dated 15 April 1945, indicates that impetigo and similar diseases were more frequent, of greater severity, and more difficult to control under tropical conditions, especially in combat troops.[11] Reporting to the Office of Scientific Research and Development in March 1945, Dr. Hopkins remarked that impetigo was encountered in the Southwest Pacific Area, particularly under battle conditions. The disease responded to treatment by penicillin ointment, but, if inadequately treated, it persisted longer in the tropics than in temperate zones. Impetigo was common in the following areas: New Guinea, Guam, the British Solomons, Nauru, the Fiji Islands, Samoa, the Wallis and Horn Islands, the Marquesas, and the Hawaiian archipelago.[12] During 1945, many cases of impetigo were reported by the 224th Quartermaster Battalion as occurring over preexisting heat rash.

In 1944, impetigo contagiosa was reported 16 times in a total of 232 cases of dermatitis in SWPA, and for the same year, the 119th Station Hospital, New Guinea, reported 5 cases in a series of 284 skin cases.[13]

European Theater of Operations.—Of 2,697 admissions to hospitals for diseases of the skin and cellular tissue reported in the European theater in November 1943, 78 were for impetigo.[14] This constituted an annual admission rate of 0.88 per 1,000 strength out of a total of 30.43 for all skin diseases.

---

11 Essential Technical Medical Data, South Pacific Base Command, 15 Apr. 1945, subject: The Pyodermias.

12 Mumford, E. P., and Mohr, J. L.: Manual on the Distribution of Communicable Diseases and Their Vectors in the Tropics. Pacific Islands Section—part I. Am. J. Trop. Med. 24: (Supp.) 1–26, May 1944.

13 Quarterly Report, Surgeon, 119th Station Hospital, SWPA, 1 July 1944–30 Sept. 1944.

14 Essential Technical Medical Data, ETOUSA, for November 1943. Appendix III.

On 6 March 1944, the Chief Surgeon, ETOUSA, called attention to the fact that too many patients with complications of simple skin diseases were being admitted to hospitals in the European theater and warned that delay in treatment led to chronicity.[15] Unit commanders were advised that cleanliness of clothing and body were necessary preventive measures.

TABLE 9.—*Admissions and admission rates for impetigo in the U.S. Army, by theater or area, 1942–45*

[Rate expressed as number per annum per 1,000 average strength]

Theater or area	Number	Rate
Continental United States	10, 754	0. 73
Overseas:		
Europe	4, 626	1. 05
Mediterranean [1]	2, 764	1. 86
Middle East	237	1. 62
China-Burma-India	1, 583	3. 61
Southwest Pacific	8, 483	4. 62
Central and South Pacific	2, 635	2. 10
North America [2]	274	. 56
Latin America	402	1. 05
Total overseas [3]	21, 233	1. 98
Total Army	31, 987	1. 26

[1] Includes North Africa.
[2] Includes Alaska and Iceland.
[3] Includes admissions on transports.

Mediterranean Theater of Operations.—Capt. (later Maj.) Emory Ladany, MC, discussing dermatology in an Army station hospital in Italy, stated that the majority of cases of pyodermia in Italy were of a most superficial type and that many of the impetigo contagiosa cases could be traced to local barber shops. Another report from the 61st Station Hospital at Foggia, Italy, listed pyodermia as the third most common dermatological condition encountered at that hospital.[16]

However, on the basis of an analysis of 3,000 consecutive cases from a military dermatological practice in which he found 131 cases of impetigo and ecthyma (4.4 percent), Lt. Col. Harry W. Woolhandler, MC, concluded that these diseases hardly warranted consideration as contagious diseases.[17]

---

[15] Circular Letter No. 34, Office of the Chief Surgeon, Headquarters, ETOUSA, March 1944, subject: Management of Simple Skin Diseases (Impetigo).

[16] Lubowe, I. I.: The Commoner Dermatoses Observed in the Italian Theater. Mil. Surg. 97: 225–232, September 1945.

[17] Woolhandler, H. W.: Dermatology in an Army Station Hospital. Arch. Dermat. & Syph. 49: 91–102, February 1944.

TREATMENT

The treatment of impetigo is discussed in detail in the Manual of Dermatology, prepared in 1942 for use in the Army at the instigation of the National Research Council.[18]

The introduction of the sulfonamide drugs contributed to the successful treatment of impetigo and thus indirectly to the prevention of its spread. In May 1943, Bigger and Hodgson of the Royal Army Medical Corps reported on a study of the bacteriology of impetigo contagiosa.[19] They made cultures from lesions of 130 patients from service personnel who had the disease and concluded that it is rarely, if ever, caused by streptococci of any type but is caused in most cases by *Staph. aureus.* The great majority of cases were cured by local treatment with sulfonamides within 10 days. Sulfonamides applied locally also helped to prevent or cure secondary infections.

Dr. Alex J. Steigman, in January 1942,[20] wrote that the increase in the incidence of scabies and impetigo had created an important medical and economic problem in industry and in the Armed Forces. This motivated him to report on an improved method of therapy which reduced the length of time required for treatment. Regarding the bacteriology of impetigo as an unsolved problem, he found that sulfathiazole, locally applied, was the most successful agent because it was effective against both *Staph. aureus* and *Str. hemolyticus.* This method reduced by half the time of treatment of 51 cases in a London hospital.

Carslaw and Swenarton [21] reported in August 1941 that 20 months' experience had shown impetigo and scabies to be the most common and troublesome skin disease in the British Navy. They shortened treatment of impetigo by use of sulfanilamide ointment and cleansing emulsions, having previously treated scabies with benzyl benzoate. Other published articles recount similar successful treatment with these drugs.[22]

When penicillin became generally available, it was found to be more effective and to expedite the time of cure.[23] Treatment of impetigo, ecthyma, impetiginized eczema, and so forth, is discussed in the *Bulletin of the U.S. Army Medical Department* of September 1945.[24] The use of sulfonamide

---

[18] Pillsbury, D. M., Sulzberger, M. B., and Livingood, C. S.: Manual of Dermatology. Military Medical Manuals, National Research Council. Philadelphia: W. B. Saunders Co., 1942, pp. 223–225.

[19] Bigger, J. W., and Hodgson, G. A.: Impetigo Contagiosa. Its Cause and Treatment. Lancet 1: 544–547, 1 May 1943.

[20] Steigman, A. J.: Sulfathiazole Ointment in the Treatment of Impetigo. Brit. M.J. 1: 12–13, 3 Jan. 1942.

[21] Carslaw, R. W., and Swenarton, J. A.: Economy in the Treatment of Impetigo and Scabies. Brit. M.J. 2: 225–226, 16 Aug. 1941.

[22] (1) Peterkin, G. A. G., and Jones, E. C.: Impetigo Contagiosa in the Services, With Special Reference to Its Treatment With Sulphathiazole. Brit. M.J. 1: 318–320, March 1943. (2) Cohen, E. L.: Local Treatment of Impetigo With Sulphanilamide. Brit. M.J. 1: 359, March 1942. (3) Schlesinger, B. E., and Martin, N. H.: Sulphonamides by Mouth in Treatment of Impetigo. Lancet 1: 527–529, May 1942.

[23] Finkle, T. H.: Parenteral Treatment of Impetigo Contagiosa. Bull. U.S. Army M. Dept. 7: (6) 506, June 1947.

[24] Dermatological Problems in Tropical Theaters. Bull. U.S. Army M. Dept. 4: 299, September 1945.

ointment is advised against, and penicillin locally and parenterally is advocated.

The dangers of sulfonamides [25] and of penicillin sensitization are not to be dismissed lightly. Neither of these drugs can always be depended upon as certain and safe cures. It should also be remembered that many drugs which are used safely in the United States are not tolerated in the tropics. Therapy should be mild. Phenol, mercury, sulfur, and keratolytic agents should be avoided in the tropics.

SAMUEL T. HELMS, M.D.

Part III. Scabies

INCIDENCE

General experience, 1942–45.—During the years 1942 through 1945, the incidence of scabies measurably increased in most theaters of military operations (table 10), and generally progressively higher rises in rates of infection were recorded in the U.S. Army. The problem was especially acute after the invasions of north Africa and Europe; in those areas, rates were highest. Exceptions to the general trend were observed only in the Middle East, where numbers of cases (237 during the 4-year period) were inconsequential, and in the SWPA (Australia), where the rate was highest in the first year of war; with this one exception, rates for scabies in the Pacific were so low as to constitute more of a routine problem in diagnosis and therapy than one of prevention. Indeed, by 1943, these rates had fallen below those of continental United States, and a report from the SWPA for May 1944 [26] specifically noted that cases of scabies, pediculosis corporis, or pediculosis pubis had been seen rarely and that only 22 cases had been diagnosed as scabies among 14,038 hospital admissions, 977 of which had been for skin conditions.

Incidence was lowest in the Pacific, CBI, and North America; yet, a field medical bulletin from the CBI (China-Burma-India theater) in 1943 indicated that scabies was ever present but that its incidence was held down to an inappreciable amount by monthly physical examinations and isolation practices. The data of table 10 substantiate the first, if not the last, part of the assertion. As far away from the pressure of refugees, crowding, and shortages as the Caribbean area, one survey of 5,000 troops made in 1944 [27] revealed that 7 percent of military personnel were infected with scabies and that there was a tendency for scabies in the tropics to be limited to the genitalia and surrounding skin areas. That tendency was observed in all years of the war and in all theaters. Its epidemiological significance is unquestionably in relation to scabies as a venereal infection. This and other aspects of epidemiology and problems of treatment and control are most clearly illus-

[25] Smith, M. S., and Jones, E. C.: Treatment of Impetigo; The Virtues of Calamine Liniment and Some Minor Drawbacks of Local Sulphonamide Therapy. Brit. M.J. 1: 699–700, 19 May 1945.

[26] Essential Technical Medical Data, SWPA, May 1944.

[27] Professional History of Internal Medicine in World War II, 1 January 1940 to 1 October 1945. The Panama Canal Department, vol. I. [Official record.]

trated by the data and experience of the Mediterranean and European theaters.

TABLE 10.—*Admissions for scabies in the U.S. Army, by theater or area and year, 1942–45*

[Preliminary data based on sample tabulations of individual medical records]

[Rate expressed as number of admissions per annum per 1,000 average strength]

Theater or area	1942–45		1942		1943		1944		1945	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Continental United States	56,499	3.83	6,331	2.38	13,410	2.59	14,478	3.65	22,280	7.60
Overseas:										
Europe	25,464	5.79	335	4.04	2,229	8.35	5,370	3.20	17,530	7.39
Mediterranean [1]	8,237	5.55	100	4.36	1,170	2.56	3,487	5.37	3,480	9.38
Middle East	237	1.62	27	4.47	70	1.32	75	1.62	65	1.59
China-Burma-India	625	1.43	4	.46	55	1.39	236	1.40	330	1.49
Southwest Pacific	3,036	1.65	281	3.95	440	2.32	1,100	2.04	1,215	1.17
Central and South Pacific	1,923	1.53	126	.83	182	.62	595	1.36	1,020	2.71
North America [2]	741	1.50	105	1.04	201	1.03	230	1.78	205	3.01
Latin America	1,122	2.94	126	1.24	357	2.95	339	3.95	300	4.12
Total overseas [3]	43,170	4.02	1,189	2.03	4,800	2.84	11,751	3.08	25,430	5.48
Total Army	99,669	3.91	7,520	2.32	18,210	2.65	26,229	3.37	47,710	6.30

[1] Includes North Africa.
[2] Includes Alaska and Iceland.
[3] Includes admissions on transports.

Prewar incidence in Europe.—The behavior of scabies as it involved the U.S. Army in Europe and in the Mediterranean areas is best given against a prewar and early war background, civilian as well as military. As the condition was not a notifiable disease, it is impossible to obtain data denoting incidence for the period from 1930 to 1938. Mellanby,[28] however, showed that a rough index of prevalence could be obtained by determining the frequency of scabies in patients admitted to hospitals for infectious disease in five English cities and presented hospital data in three large suburban boroughs with more than half a million inhabitants and in two smaller, quasi-rural boroughs. When patients were admitted to those hospitals, the presence of scabies was recorded in addition to the disease for which they were admitted. Thus, for all practical purposes, such data are in the nature of a survey and, although the selection of patients is undoubtedly biased, nonetheless it confirms clinical impressions of an increasing prevalence of the condition as Great Britain moved to mobilization and declaration of war. Further reasons for the increase in scabies before the actual outbreak of hostilities are speculative, but propagation of the infection afterward, during a period of great disruption of normal family life, with the aggregation of people in air-raid shelters and the like, is readily understandable.

By 1942, scabies was frequent among both civilians and troops in the United Kingdom. It is hardly surprising that rates among British soldiers in their own homeland remained consistently higher than rates among U.S.

[28] Mellanby, K.: The Incidence of Scabies in England. M. Officer 66: 141, 1 Nov. 1941.

troops (chart 1). Nor is it surprising that, in 1943, rates among Americans in the European theater (England) rose; indeed, they reached the highest incidence observed in any theater until 1945 (table 10). A pronounced seasonal exacerbation in the winter months of 1942 and 1943 is observed in chart 1. Table 11 reveals a similar seasonal rise in rates in the European and Mediterranean theaters during the coldest months of 1944. That the influence of season is less important than the influence of social factors consequent to winter crowding and slowing of battle activity was demonstrated by later experience and by the sharp rise in incidence for the year 1945 when high rates were observed in the summer months that followed V–E Day.

TABLE 11.—*Admissions for scabies in the U.S. Army, by theater or area and month, 1944*

[Preliminary data based on sample tabulations of individual medical records]

[Rate expressed as number of admissions per annum per 1,000 average strength]

Theater or area	Total		January		February		March		April	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Continental United States	14,478	3.65	1,734	4.34	1,608	4.45	1,662	4.46	1,250	3.58
Overseas:										
North America [1]	230	1.78	8	.54	21	1.58	22	1.67	22	1.85
Latin America	339	3.95	46	5.54	40	5.30	42	5.20	39	5.18
Europe	5,370	3.20	400	5.54	445	5.58	460	4.75	360	3.34
Mediterranean [2]	3,487	5.37	209	4.00	231	4.69	375	6.98	243	4.33
Middle East	75	1.62	12	2.87	22	5.65	8	2.08	5	1.37
China-Burma-India	236	1.40	11	1.34	12	1.44	20	2.01	20	1.84
Pacific Ocean Area	595	1.36	25	.77	41	1.20	42	1.09	48	1.24
Southwest Pacific	1,100	2.04	52	1.96	60	2.13	79	2.42	56	1.53
Total overseas [3]	11,751	3.08	775	3.38	892	3.85	1,077	4.10	812	2.90
Total Army	26,229	3.37	2,509	3.99	2,500	4.22	2,739	4.31	2,062	3.28

Theater or area	May		June		July		August	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Continental United States	1,124	3.17	804	2.40	590	1.74	579	1.76
Overseas:								
North America [1]	24	2.07	14	1.31	12	1.15	19	1.94
Latin America	26	3.47	24	3.47	34	4.91	26	3.80
Europe	280	2.24	235	1.80	235	1.62	210	1.35
Mediterranean [2]	305	5.16	245	4.22	305	5.12	245	4.29
Middle East	8	2.20	2	.54	3	.77	4	1.03
China-Burma-India	14	1.01	16	1.14	19	1.23	23	1.42
Pacific Ocean Area	56	1.44	92	2.39	74	1.99	52	1.34
Southwest Pacific	82	1.95	120	2.77	116	2.34	148	2.90
Total overseas [3]	803	2.61	782	2.52	828	2.46	739	2.14
Total Army	1,927	2.91	1,586	2.46	1,418	2.10	1,318	1.96

See footnotes at end of table.

559625v—61——10

TABLE 11.—*Admissions for scabies in the U.S. Army, by theater or area and month, 1944*—Continued

Theater or area	September		October		November		December	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Continental United States	908	2.98	1,320	4.48	1,445	5.32	1,454	5.58
Overseas:								
North America [1]	23	2.58	26	2.96	14	1.68	25	3.30
Latin America	18	2.78	18	2.72	10	1.55	16	2.42
Europe	395	2.43	620	3.43	760	3.86	970	4.32
Mediterranean [2]	256	4.47	320	5.81	347	7.21	406	9.25
Middle East	1	.27	1	.25	4	1.06	5	1.26
China-Burma-India	11	.68	14	.80	34	1.85	42	2.12
Pacific Ocean Area	54	1.41	46	1.24	36	1.07	29	.89
Southwest Pacific	161	3.13	104	1.83	74	1.25	48	.77
Total overseas [3]	938	2.67	1,190	3.18	1,313	3.44	1,602	3.92
Total Army	1,846	2.81	2,510	3.75	2,758	4.22	3,056	4.57

[1] Includes Alaska and Iceland.
[2] Includes North Africa.
[3] Includes admissions on transports.

CHART 1.—*Comparative admission rates for scabies, U.S. and British troops in the United Kingdom, 1942–44*

Source: Gordon, J. E.: A History of Preventive Medicine in the European Theater of Operations, U.S. Army, 1941–45, vol. II, pt. 3, sec. 6, Scabies. [Official record.]

A rising trend in the prevalence of scabies among civilians during the early war years occurred in France much as in England. At l'Hôpital de Saint-Louis, Paris, which specializes in skin diseases, a sharp rise in the number of cases of scabies treated was noted immediately following the influx of refugees during the summer of 1940; the hospital treated 9,859 cases in 1939 and 24,559 cases in 1940.[29] In 1941, 65,875 cases of scabies, and in 1942, 102,645 cases, were treated in the hospital; this was a tenfold increase in the course of only 3 years. Similar rises assuredly occurred in other countries of Europe, north Africa, and the Middle East. No data are at hand concerning the incidence of scabies among Arabs in Morocco, but the contacts between U.S. troops and the indigenes of north Africa were distinctly limited in 1943 as compared with those that existed in 1944 with the civilian population in Italy. The admission rates for scabies in the Mediterranean theater during these 2 years were 2.56 and 5.37 per 1,000 average strength, respectively.

European and Mediterranean Theaters of Operations.—Although throughout the whole war the greatest number of cases (56,499) were diagnosed in the continental United States, the most pressing problems in terms of numbers, rates, and urgency—for example, among replacement troops about to go into the line—occurred in Europe, especially in Italy, the United Kingdom, France, and Germany. In those countries, U.S. troops were situated among civilian populations that had been longest at war and had consequently experienced a high prevalence of scabies. In the U.S. Army overseas, spread of scabies gained momentum in 1943 and initial rates of 1942 had almost tripled by 1945. That most of the cases were contracted overseas was demonstrated by surveys of recently arrived troops which consistently showed relative, if not absolute, freedom from this skin disease.[30] The good condition of new arrivals was assuredly due in large part to the successful screening and processing at points of embarkation. Although not outstandingly high, the rates of admissions for scabies in the United States were high enough to have increased the incidence of scabies in Europe, had the disease gone undetected and untreated. Rates for scabies in the Mediterranean and European theaters stayed consistently above those of other theaters and of the continental United States. The difference in rates in favor of the United States is far greater than is apparent in the data of table 10, because a significant percentage of cases contracted overseas were credited to continental United States after arrival home and because many more patients went unreported in the war zone than in the Zone of Interior.

While it is true that scabies, like pediculosis and venereal disease, tended to flourish among troops and civilian populations when bathing facilities and soap were scarce, propagation of the disease was associated with, rather than

---

29 The Spread of Scabies. Health Division, United Nations Relief and Rehabilitation Administration, Epidemiol. Inform. Bull. 1 (No. 10): 405, 30 June 1945.

30 Gordon, J. E.: A History of Preventive Medicine in the European Theater of Operations, U.S. Army, 1941–45, vol. II, pt. 3, sec. 6, Scabies. [Official record.]

caused by, such shortages. In the continental United States, where such facilities were far superior to those of oversea stations, reported incidence and annual admissions for scabies, although generally lower than those in Europe, were, nonetheless, too high for mere cleanliness to have been the critical factor.

One principle that emerged clearly through the years 1942–45 is that the frequency of scabies in military personnel is dependent, among other factors, on the frequency of scabies among civilians and on opportunity for fraternization. For example, some 2,130 cases were reported to the Surgeon, MTOUSA (Mediterranean Theater of Operations), in April, May, and June 1945. The rates among combat troops for these 3 months were 22, 43, and 57 per 1,000 average strength, respectively, while the rates among service troops during the same 3 months were significantly higher; namely, 54, 56, and 77.[31] An effect of fraternization is implicit. That transmission was for the most part by direct contact was shown in the early part of the war by Mellanby,[32] who stated: "In 63 experiments using underclothing and blankets scabies was transmitted twice only, although everything was done to favour transmission. In none of the experiments (25 in all) using blankets alone, was infection transmitted, and * * * under normal conditions blankets can seldom be responsible for the transmission of the disease. On the other hand, a small number of the experiments have shown that transmission by comparatively slight personal contact may be readily accomplished." This view was confirmed by field experience in which conversations and clinical evidence indicated that infection was contracted in the same manner as was a venereal disease in more than one-half the cases.

Given a large enough primary focus of infection among close-knit troops, however, an undetermined but significant amount of indirect spread undoubtedly occurs. For example, one report from the Southwest Pacific Area revealed 5 cases of scabies among 59 enlisted men in a guard detachment.[33] On investigation, it was found that members of the guard were using beds and bedding indiscriminately.

TREATMENT AND RESEARCH, 1941–45

Failure to cope adequately with the two most important facts—that scabies is essentially a contact disease and in large part a venereal disease—was assuredly the most significant deficiency of the military program which was developed to control scabies during World War II. Much of this deficiency arose from the situation of the moment. However, too much time and effort was given in the early years of the war to a search for a perfect scabicide and to disinfection of clothing, whereas basic remedies were already

---

[31] Essential Technical Medical Data, Hq. MTOUSA, 1 Aug. and 29 Aug. 1945.

[32] Mellanby, K.: The Transmission of Scabies. Brit. M.J. 2: 405–406, 20 Sept. 1941.

[33] Letter, Capt. N. J. Serlin, MC, Attending Surgeon, to Chief Surgeon, SWPA, 11 Jan. 1943, subject: Special Inspection of Guard Detachment, Headquarters, United States Army Services of Supply.

satisfactory and commonsense hygiene and a simple clothing exchange would have sufficed in ordinary circumstances to combat indirect spread of infection. Not enough attention was given to the plight of civilians and, in particular, to civilian contacts of infected soldiers; to the indoctrination of the soldier about the disease; and to joint command responsibilities for control of the disease—especially among resting troops, replacement troops, and service troops.

Overemphasis on clinical aspects of scabies contributed to an oversimplified concept of the disease as being due to a single cause (*Sarcoptes scabiei hominis*) and, hence, amenable to a single solution. It followed that, if instructions were rigid and therapy meticulous, the disease should be controllable. Thus, the first North African directive on treatment of scabies, dated 27 November 1942,[34] stated: "As soon as the medical officer has made the diagnosis the patient will be painted from neck to feet with benzyl benzoate emulsion or solution * * *." The directive gave 12 additional unequivocal instructions—most of them clear, incisive commands—even specifying that 2 fluid ounces were to be applied with a brush and that the patient was to shower and be rechecked once weekly for 6 weeks. The difficulty was not merely that benzyl benzoate was for all practical purposes unobtainable, but the directive implied that control of scabies was a matter of treatment; it made no allowance for the social characteristics of the human host and the dynamic contribution of his shifting social environment. Location of source of infection and treatment by focal attack is essential to control.

In the interest of an improved rationale for treatment, English research of 1940 and 1941 came to focus largely around the behavior, in vivo distributions, and in vitro survival of *S. scabiei;*[35] effective ways to administer sulfur; and the penetration of oily and alcoholic vehicles developed for applying benzyl benzoate.[36] The merits of sulfur, long since established, were fully confirmed, and benzyl benzoate was added to the dispensary list of therapeutics; it was seldom to be found on dispensary shelves during the North African and Mediterranean campaigns.

Productive as such research was—and it was undoubtedly the most productive on the subject throughout the war—it was concerned primarily with treatment and secondarily with the inadequacy of "stoving" measures directed against transfer by fomites; it hardly came to grips with prevention. A realistic appreciation of the complexity of supply aspects is more evident

---

[34] British circular letter, Assistant Director of Medical Services, No. 1 Base Sub Area, 27 Nov. 1942, subject: Treatment of Scabies.

[35] (1) Mellanby, K., Johnson, C. G., Bartley, W. C., and Brown, P.: Experiments on the Survival and Behaviour of the Itch Mite, *Sarcoptes scabiei De G.* var. *hominis*. Bull. Entomolog. Research 33: 267–271, December 1942. (2) Johnson, C. G., and Mellanby, K.: The Parasitology of Human Scabies. Parasitology 34: 285–290, November 1942. (3) Buxton, P. A.: The Parasitology of Scabies. Brit. M.J. 2: 397–401, 270 Sept. 1941. (4) See footnote 32, p. 116.

[36] (1) Gordon, R. M., and Seaton, D. R.: Observations on the Treatment of Scabies. Brit. M.J. 1: 685–687, 6 June 1942. (2) Gordon, R. M., and Seaton, D. R.: A Histological Comparison of the Effects of Certain Drugs on Scabies, as Studied in Rodent Infections. Ann. Trop. Med. 35: 247–268, 31 Dec. 1941.

in British directives than in U.S. Army directives of 1942; the former contain fewer orders and more homely but practical observations.

The procedures used in the control of scabies in the U.S. Army were, to a large extent, based on British research contributions of Mellanby, Johnson, Bartley, and others before the United States was a belligerent power. These investigators successively reviewed and extended knowledge of the life history, habits, survival, and transmission of the parasite and of the treatment of the infection. The work was important and basic, not so much for anything that was strikingly new as for the clear definition of biological facts and quantitative studies that were made. The work indicated, for example, that the average number of mites per man was approximately 10 to 15; that severe cases may have few parasites, whereas patients with few symptoms may have large mite populations; and that indirect contact is of far less importance than direct contact in transmission.

Relative to the necessity for disinfestation of clothing and bedding of patients, the evidence from Great Britain during the early part of the war showed that to give meticulous attention to fomites was to dissipate time, effort, and money, and to underemphasize the major importance of direct contact in transmission of the infection. One study showed that, among 2,100 patients treated without disinfestation of personal belongings, there were 99 relapses explainable by reinfection and an additional 47 (2.2 percent) in which reinfection from human sources did not appear to have been likely. Further investigation was made of an unstated number of patients from 3,700 families in which care had been taken to disinfest personal effects of patients but little or no effort had been made to bring all members of the household group under observation or treatment; 22 percent of these families required re-treatment. Of 793 families containing an unstated number of patients in whom efforts were made to include for observation every member of the household, while the fomites received little attention, members from only 6 families relapsed. The implication is that it is much more important to take into account the family itself than to consider the family possessions.

The conclusion that an extensive disinfestation program was unjustified by no means contraindicated the simple ordinary measures of personal hygiene in relation to scabies—bathing and a change to clean clothing, if possible. The practical result of research was to demonstrate that both sulfur and benzyl benzoate were effective agents with which to cure scabies and that preliminary washing and scrubbing of the skin facilitated the scabicidal action of the drugs tested. Even the manner and place of bathing was the subject of thorough discussion, and the records of a meeting of some 25 experts of the British Ministry of Health in March 1942 state "* * * the merits of shower v. slipper baths were discussed and it was decided that a slipper bath was much more satisfactory but where this was impossible a shower bath would suffice." It was asserted that one advantage in favor of the slipper baths was that the nurse could supervise the patient more closely

than when a shower was used. Showers, however, could be arranged to deliver the water at about shoulder level rather than directly over the patient's head in order to avoid wetting women's hair. Some discussion took place at the meeting on the length of time which should be spent in a bath or under a shower, and it was agreed that soaking in a bath for 10 minutes or washing under a shower for 5 minutes might be adopted as a working rule. The use of a scrubbing brush was deprecated, and it was agreed that a flannel washcloth might well be substituted. It was the consensus that, in view of the shortage of soft soap, hard soap would be quite satisfactory.

As the war progressed, it became evident that the most important factor in prevention of lost time and disability from scabies was early recognition and treatment in the dispensary. That this goal was far from consistently attained in the Mediterranean theater is implicit in the stated opinion of dermatologists who convened in 1945 to discuss major dermatological problems of the theater. They were in agreement that scabies accounted for the great bulk of absenteeism caused by parasitic disease. Prolonged absenteeism primarily due to scabies all too frequently resulted from secondary infection, scratch dermatitis, overtreatment, or sensitization of the skin. Sulfur was preferred in cases complicated by secondary infection. The average stay of patients admitted to station and general hospitals with complications or secondary infections was found to be about 2 weeks, and it was actually necessary to evacuate to the Zone of Interior an undetermined number with chronic dermatitis due to scabies with superimposed infection and underlying skin allergies. It was found necessary to devote considerable effort to training ancillary personnel in the details of treatment. Nor did it suffice to supply the soldier-patient with antiscabies medication together with verbal directions for using an ointment. It was better to supply the patient with a printed sheet setting forth in simple, detailed language the treatment routine, the reasons for it, and the necessity for complete compliance with directions in order to assure relief. Failure to comply meant risk of reinfection if the source was venereal, of exacerbation otherwise, and of secondary infection in either event.

CIVILIAN-MILITARY INTERRELATIONS

Reasonable and satisfactory as were the therapeutic procedures evolved in 1941 and 1942, they had serious limitations when put into effect in field dispensaries away from urban and general hospitals during the invasions of Morocco, Algiers, Italy, France, and Germany. Then benzyl benzoate was more often than not in short supply. More important, the source of much of the disease was the civilians, a condition which went largely unnoticed and unchecked.

One of the first to solve this problem for a civilian population deprived of petrolatum and lanolin with which to manufacture ointment was a French physician of Casablanca, Dr. E. Lépinay, chief of dermatology at l'Hôpital

Jules Columbo. He conceived the idea of using a U.S. Army quartermaster item, agricultural spray—a finely emulsified alkaline oil used in spraying orange trees and available through Allied Military Government in ample quantities—as a vehicle for the suspension and application of sulfur. Pilot experiments, first with the unmixed oil (huile blanche) and then with sulfur added, revealed a completely satisfactory medicament, and, during the years 1943–44, hundreds of civilians in the vicinity of Casablanca were successfully treated and cured of scabies. Since the cooperation of infected civilians was seldom difficult to obtain when the situation was explained by their own physicians or by U.S. soldiers involved, the way was open for attacking sources through which Army personnel were being infected. As a principle, however, this or a similar plan designed to prevent rather than cure scabies by controlling civilian reservoirs of infection was never developed to the extent that would have been feasible.

When both sulfur ointments and benzyl benzoate were unobtainable, the writer and others had occasion to confirm many times the efficacy of sulfur in agricultural spray. Only once was more than minor irritation of the skin encountered; this occurred in the late winter of 1945 among soldiers freshly treated with sulfurated oil and gathered around a field stove to warm themselves. Unquestionably, the unusual amount of heat to which the skin was subjected in this instance contributed to a sulfur dermatitis that was observed later.

Scabies as a clinical problem was much the same in every theater, but the mass problem was continuously changing. Scabies in the 1st Armored and 1st Infantry Divisions during the winter defensive of 1942–43 in Morocco and Algiers was not the same problem as scabies a year later among service troops in the vicinity of Naples or the disease encountered on Saipan in 1944, or at redistribution points in Bremerhaven after the war in Europe was over. The following history illustrates the point—scabies arising in epidemic proportions against a particular military and civilian background and scabies in troops coming from replacement units in the vicinity of Rome to Arno Valley depots and thence into the line during the winter months of 1944–45.

An outbreak having its source around Rome was identified quite by chance in the vicinity of Florence simply because both benzyl benzoate and ointment bases were in short supply and because centralization of cases for treatment brought centralization of vital statistics that made appreciation of the situation possible and indicated the source of the outbreak 200 miles further down in Italy around Rome. No headway could be made against the development of an ever-increasing stream of new cases until attention was transferred to the problems of the replacement and training command in Rome.

Detachment C of the 50th Station Hospital had been set up at Ponte a Evola, 40 miles south of Florence, in December 1944 and January 1945, in

order to care for a depot of some 10,000 replacement troops (fig. 11). New units arrived from Rome as others moved forward into the Po and Arno Valleys. The overall medical problem was to supplement medical care being handled on a dispensary basis by four battalion surgeons, with each sick call averaging between 60 and 120 patients and with the nearest general hospital in Florence, 40 miles to the north approachable only over bumpy roads in midwinter. The hospital detachment had been started with the expectation that it would be a consultation clinic; as it was coming to completion, military authorities decided that the unit would exercise a complete station hospital function, but with half the staff of the conventional station hospital. This meant that each physician allotted by the table of organization exercised a dual role: the commanding officer, for example, was also roentgenologist, and the chief of the medical service was also dermatologist.

FIGURE 11.—Detachment C, 50th Station Hospital, Ponte a Evola, Italy, spring of 1945.

When the detachment first began to operate in January 1945, no less than 95 of the first 221 medical consultations were for the diagnosis and treatment of scabies; yet neither benzyl benzoate nor ointment bases were to be had, and reliance had been placed on 1-ounce tubes of sulfur ointment, self-applied. In fact, no benzyl benzoate had been available through supply channels since the opening of the depot in September 1944. Hence, the centralized treatment of all patients with scabies was undertaken with 10 percent sulfur in agricultural spray. Beginning on the 8th of February, soldiers were treated on an ambulatory status, arrangements being made for clothing exchange after treatment. Nearly one-half were cured with two applications of the sulfurized spray, applied with a paintbrush in the morning and again in the evening; the rest required a second and third course, at weekly intervals.

Despite the improved therapy, rates for scabies continued to mount, from 30 in the 8th Replacement Depot, for example, in December 1944 to 35 and 170 per 1,000 average strength per annum in January and February 1945, respectively. Analysis of 50 cases revealed that 5 weeks was the average duration of symptoms before treatment. Both history and distribution of the papules indicated that the disease was of venereal origin in perhaps one-half of the cases and that the source of a mounting epidemic was at the large replacement center at Rome, with transmission occurring before troops arrived in the encampment at Ponte a Evola. This conclusion was brought to the attention of Col. William S. Stone, Chief, Preventive Medicine Division, Allied Forces Headquarters, who at the same time was being acquainted with mounting scabies problems elsewhere in the theater, notably in the 6th Port Battalion at Pisa and in Stockade No. 1 at Aversa. The situation was considered serious enough for formation temporarily of a three-man scabies commission, with Maj. Robert Buchanan, Jr., MC, and Capt. Lewis Capland coping with general problems in northern Italy. The author was assigned to the Office of the Surgeon, Headquarters, Replacement and Training Command, MTOUSA, to devote a month's attention to the situation developing at Rome, where personally conducted surveys of 1,304 men revealed more than 2 percent to be infected with scabies.[37]

To set up a scabies detection program on a larger scale meant merely to increase the objective of "short arm" inspection. Despite the drudgery of lining up and inspecting a naked company, this is a most profitable method for the prevention of lost time and disability due to numerous medical causes. Detection of venereal disease is only part of the gain. Rashes, fungus infections, dots denoting crab lice, nits of body lice, scabies, chiggers, mites, and various other entomologic and microbiologic bedfellows may be detected at a glance and as a tangible reward for the most dreary assignment that befalls the lot of the battalion surgeon. If the men then sit down in a line with their feet out and with the little toes held apart, because of the predilection of athlete's foot for the interface between 4th and 5th toes, then trichophytosis, with and without infection, and plantar warts, a most important cause of chronic disability, may be detected on the way back.

Most cases having been identified, attention was given to improved therapy, even to the sterilization of clothing by means of steam. The practice of dispensing 1-ounce tubes of sulfur ointment was discontinued. To remedy supply deficiencies, both benzyl benzoate and emulsion base were obtained from a nearby hospital, and soldiers were treated on a duty status with supervised application of the scabicide. Treatment was prescribed so that the soldier would remain covered with ointment for at least 12 hours, and then treatment was repeated in a week in order to kill off newly hatched, second-generation mites. A check was stipulated at the end of 2 weeks. Finally, to facilitate coordination of command and medical action, mimeo-

[37] Ingalls, T. H.: Scabies Survey Report to the Surgeon, MTOUSA, 21 Apr. 1945.

graphed information and instructions were prepared for distribution to company and unit commanders as well as patients. This step was as important as any of the others. The information and instructions are reproduced in appendix A.

Because emulsion base seemed an excellent vehicle for the application of both sulfur and benzyl benzoate, patients at one dispensary during the month of April were treated with 30 percent benzyl benzoate in this base. Those at at another dispensary were treated with ointment containing 20 percent sulfur, 10 percent sodium carbonate, and 70 percent emulsion base. Results are given in table 12. Two applications, a week apart, of either ointment appeared to give definitely better results than a single treatment. This was interpreted to mean that a second generation of mites had hatched after the ointment was first applied. On the other hand, objective scientific evaluation of these data is not possible because it is not known to what extent reinfection entered into failures, and the criterion of cure or failure was necessarily subjective and perhaps biased in favor of benzyl benzoate. It did not seem necessary to add an ovicide to these ointments of known efficacy, and re-treatment at least once seemed a reasonable measure of insurance in the light of the social setting.

TABLE 12.—*Results of treatment of 273 patients with scabies*

Number of treatments at weekly intervals	Patients cured with sulfur emulsion		Patients cured with benzyl benzoate emulsion	
	Number	Percent	Number	Percent
One	50	36. 23	35	25. 92
Two	70	50. 72	50	37. 04
Three	16	11. 60	37	27. 41
Four	2	1. 45	13	9. 63

In order to extend action beyond treatment and toward prevention, attention was next given to the civilian problem through the cooperation of Lt. Col. Gordon M. Frizelle, RAMC, Chief, Allied Commission Public Health Department in Rome, and Professor Tarantelli, Chief, Dermatology Department, University of Rome. Both were highly interested in the possibility of being able to replace unobtainable petrolatum and lanolin ointments with a cheap, effective scabicide manufactured from sulfur and agricultural spray. A drum of spray was procured with which to mix sulfur which had always been plentiful. Thus, an ointment equivalent was made available for civilians, and large-scale treatment was carried out for the first time in many months. The full effect of the overall program is not subject to statistical demonstration, but it is known to be good, and in May 1945 troops with a high incidence of skin infections were no longer being forwarded for replacement directly into combat.

A last report of increased incidence of scabies as the war ended demonstrated again the multiple causes of localized outbreaks—a specific locale, a particular season, a given period of hostilities—all were critical factors in determining whether the disease became epidemic or stayed endemic in a specified unit.

Data from 12 of 15 redistribution stations in operation at the cessation of hostilities show an annual incidence rate of 12.9 per 1,000 average strength for 1945, as compared with a rate of 6.9 during the same year for the four service commands in which the 12 stations were located, pointing to a higher incidence among troops returning on rotation. This increase in scabies was widespread, however, as is indicated by the fact that the First, Sixth, and Seventh Service Commands, containing no redistribution centers, reported rates of 11.4, 14.6, and 12.1 per 1,000 per annum, respectively. There is no reason to doubt that the high rates of 1945 (table 10) reflected increased mingling with an infected civilian population after V–E Day, nor to doubt that they can be regarded as of contact (mostly venereal) origin.

SUMMARY

A noteworthy fact in the U.S. Army of World War II, with respect to scabies, was the establishment of a rate for the 4 years 1942 to 1945, inclusive, of 4.02 per 1,000 average strength per annum in oversea troops. This compares with an incidence of 42.71 in the trench warfare experience of British Expeditionary Forces, 1914–18, and an oversea admission rate of 11.90 per 1,000 average strength per year in the U.S. Army in World War I. Obviously, one significant factor was the difference between a war of movement and a war of attrition. Indirect transfer of mites in trench dugouts presumably played a much more important role in transmission than did indirect contact in tanks, on trucks, and in planes; and, presumably, the preventive effect of both hygiene and therapy was stronger in World War II. In fact, from 1941 to 1945, experience for the whole Army with respect to the control of scabies was so good that it became possible to demonstrate the interweaving of a particular civilian situation with a military epidemic. Scabies emerged as more of a problem among resting, replacement, and service troops than among troops in the line.

In retrospect, it is evident that sulfur in some sort of mildly alkaline oil emulsion similar to agricultural spray could have been made widely available for the use of civilian populations at extremely low cost and cargo space and to military advantage. Now that aerosol apparatus has been perfected for brushless shaving creams, it is also evident that this kind of device and emulsified base would have been ideally suited as a dispensing container and vehicle for sulfur or benzyl benzoate. Each of these two excellent and time-tested agents constitutes a satisfactory scabicide, benzyl benzoate holding the esthetic advantage. Although a new and perfect agent on the dispensary shelves would always be welcome, needed research today

would appear to be along other lines. It is highly desirable to determine whether a second application of the two most satisfactory ointments already available, about a week after the first, is necessary to take care of mites that have hatched from eggs of first-generation females; to investigate epidemiologically civilian-military relationships and possibilities of true prevention; and to establish desirable frequencies for screening (by cursory inspection) soldiers at risk.

It is curious that in World War II, during times of epidemic, the tendency was to look for the source of difficulty in the therapeutic agent being used, whereas more effort should have been directed toward compilation of statistical and conversational data leading toward contacts and specific and general civilian problems, as is done for syphilis and gonorrhea. The civilian problem could have been attacked more vigorously than it was, through existing agencies of military government and public health. When failures of therapy occurred, the possibilities should have been investigated that the exacerbation was due to reinfection, as well as therapeutic failure, or that the failure was due to the hatching of eggs already present in the skin during initial therapy. Neither benzyl benzoate nor sulfur is reputed to be ovicidal, but the necessity for adding benzocaine as an ovicide has been questioned because of the greater likelihood of dermatitis from "shotgun therapy."

Experience during World War II showed that, with rates of less than 5 per 1,000 average strength per annum in any sizable unit, the problem therapeutically and prophylactically was minor; when rates rose above 10, the implications were that scabies was of endemic significance in the civilian population; and when the incidence among U.S. troops began to soar toward 50 or 100, the indications usually were clear that the disease was epidemic among civilians as well. Under these circumstances, the problems of civilian therapy, fraternization, and command responsibility assumed critical importance in the reduction of case rates among Army personnel. Early diagnosis as well as carefully administered therapy of patient, contacts, and infected members of a contact's family, rather than mere cure, were basic to prevention and control. While it was not found necessary to disinfect fomites regularly, there were occasions when such procedures were indicated; and the principle did not negate a change to clean clothes after therapy, the washing of regularly worn uniforms, and a blanket exchange. More emphasis should have been given to supplying hospitals and clinics in occupied areas with cheap, mildly alkaline oil emulsions for civilian use as vehicles for the application of sulfur.

THEODORE H. INGALLS, M.D.

CHAPTER VIII

Trachoma

Thomas G. Ward, M.D., Dr. P.H.

Trachoma is a contagious disease of the eye which is caused by an unidentified organism. The causative agent exemplifies some of the characteristics of both the viruses and the rickettsiae. The organism leads to local inflammation in the conjunctiva, both the tarsal and bulbar areas, and the local inflammation is characterized by the formation of granules, corneal ulcers, pannus, and, ultimately, scar formation with possible paralysis of the palpebral muscles.

EPIDEMIOLOGY

Soldiers returning from Africa during the Napoleonic wars introduced trachoma into Europe late in the 18th century.[1] After the introduction, the disease rapidly spread to all of Europe and has maintained high endemicity in the Balkan States. It is now worldwide, and in some countries surveys have indicated that a large proportion of the population is affected. For example, in Egypt, 98 percent of the population is affected; in India, 75 percent; in Siam, 65 percent; and in both Malaya and Poland, 50 percent. The Indians in the United States had an incidence of about 26 percent in 1937, but by 1941, the judicious use of sulfanilamide had reduced this incidence to 3 percent.

There seems to be a racial type of immunity, or, rather, the agent may have an affinity for some races. Jews, Mongols, and Poles seem to have higher attack rates than do other Caucasians living in the same areas. Negroes seem to be affected only slightly, with the exception of those living in western Africa. Economic status may play an important role in the incidence of the disease, in that in Egypt the attack rates are highest among the lower economic levels. Two explanations offer themselves, neither of which has been proved experimentally: (1) Persons of low economic status have a poorer nutritional state, and, consequently, in these people the tissues of the eye are more susceptible and (2) the environment of lower economic groups is not so clean and the contact rate between patient and susceptible contact (usually infant) is correspondingly higher.

Formites play an important role in the transmission of the disease, in that mothers have been seen wiping the trachomatous material from their

[1] Murray, W. B.: A Review of Trachoma. Canad. M.A.J. 60: 574–580, June 1949.

eyes and immediately cleaning the children's eyes with the same cloth. In addition, flies are probably important carriers, in that the swarms of flies noted in the eyes of Egyptian children are surely capable of physically transporting the infectious material to the eyes of susceptible playmates.

ETIOLOGY

The cause of trachoma (*Chlamydozoa trachomatis*) was discovered independently in 1907 by Halberstaedter and Prowazek [2] working in East Prussia, and by Greeff, Frosch, and Clausen [3] working in Java.

The Prowazek-Halberstaedter body is the inclusion found intracytoplasmically next to the nucleus. It measures approximately 3 by 13 microns and may contain smaller elementary bodies of the order of 250 millimicrons. The inclusion bodies stain blue with Giemsa's stain and the large-sized ones contain the elementary bodies which stain red with Giemsa's stain. The inclusion bodies are the pathognomonic sign but according to Stewart [4] may be found in about 40 percent of the cases when one surveys all cases of trachoma. However, if examination is limited to early cases, then the inclusion bodies may be found in practically all cases.

Some workers consider the agent of trachoma as a rickettsia and list the following points as favoring such a view: Staining reaction with Giemsa's stain; cytoplasm of the host cell is filled with small, red staining bodies which are not restricted to a definite inclusion body; and no proof of insect parasitism for the *Chlamydozoa* for trachoma or related diseases has been forthcoming. Other workers [5] believe the agent to be a virus, in that it is filterable and has not been grown on lifeless media.

The only laboratory animals which may be infected with certainty are the baboon and the grivet. This makes research in the disease all the more difficult, and most of the observations with respect to infectiousness have been made through the use of human volunteers. Stewart reported the agent as filtrable through collodion membranes of 0.6 to 0.7 micron average pore diameter. Titration experiments indicate that the infectious agent collects on the upper surface of the filter.

CLINICAL SYMPTOMS

The clinical findings in trachoma are confined to the eye. In the early stages there is photophobia, itching, and lachrymation, and patients complain of a scratching sensation in the upper lid. The disease progresses until the patient begins to notice an abnormality of the upper lid, in that

[2] Halberstaedter, L., and Prowazek, S. von: Über Zelleinschlüsse parasitärer natur beim trachom. Arb. a.d.k. Gsndhtsamte. 26: 44–47, 1907.

[3] Greeff, Frosch, and Clausen: Untersuchungen über die Entstehung und die Entwicklung des Trachoms. Arch. f. Augenh. 58: 52–63, 1907.

[4] Stewart, F. H.: The Aetiology of Trachoma. Brit. J. Ophthal. 23: 373–380, June 1939.

[5] Thygeson, P., and Proctor, F. I.: The Filtrability of the Trachoma Virus. Arch. Ophth. 13: 1018–1021, June 1935.

it cannot be raised properly, or until he notices corneal ulcers and dimming of vision. It is at about this stage that the patient presents himself to a physician, but the damage that has been done is irreversible, and therapy can only stop the progress of the disease.

MacCallan [6] has classified the disease into four stages, with clinical symptoms as follows:

First stage: Lymphocytic infiltration with or without lymphoid follicles. Usually located beneath the conjunctival epithelium.

Second stage: Conjunctival blebs or papillary hypertrophy as a complicating state.

Third stage: Scarring, with absorption of the lymphocytic infiltration.

Fourth stage: Complete cicatrization in the absence of apparent inflammation.

As the disease progresses from stage to stage, there is an early loss of normal gloss of the conjunctiva, followed by the slow subacute inflammation leading to a dark cherry color of the blood vessels lining the upper eyelid. The pannus begins at the upper pole of the limbus as a grayish white curtain which progresses downward into the pupil. The ulcer is located centrally in the cornea which is the point farthest from the blood supply. The final result is that the upper lid hangs downward over the pupil and the eyelashes are turned inward, scratching the eyeball, which is smaller in size than normal.

TREATMENT

The treatment of trachoma, as recommended by the Bureau of Indian Affairs, U.S. Department of Interior, is to administer sulfanilamide in doses of one-third grain per pound of body weight for 10 days and in doses of one-fourth grain per pound for the following 2 weeks. The incidence has been cut from about one-fourth to about one-thirtieth by a preventive sulfanilamide therapy as noted above. Local treatment with sulfonamides [7] and penicillin [8] has been reported as beneficial in this disease.

SUMMARY

Trachoma was not a serious disease in the Army during World War II. There was a total of 826 admissions for the disease reported during the years 1942–45 (table 13). These occurred as follows: 164 in 1942; 351 in 1943; 171 in 1944; and 140 in 1945. Approximately 538 admissions were reported from troops in the United States, the remainder from troops stationed overseas. Of the oversea areas, the Southwest Pacific Area and the Mediterranean theater (including North Africa) reported the highest num-

---

[6] MacCallan, A. F.: Trachoma. London: Butterworth and Co., Ltd., 1936.

[7] Miterstein, B., and Stern, H. J.: Treatment of Acute Conjunctivitis and Trachoma With Sulfonamides. Lancet 1: 649–650, May 1945.

[8] Darius, D. J.: Penicillin Treatment of Trachoma. Am. J. Ophth. 28: 1007–1009, September 1945.

ber of admissions for trachoma. The highest admission rates were reported from the Middle East and Mediterranean areas. In all other areas, the number of cases was so small that no preventive medicine problem of any consequence was presented.

TABLE 13.—*Admissions for trachoma in the U.S. Army, by theater or area and year, 1942–45*

[Preliminary data based on sample tabulations of individual medical records]

[Rate expressed as number per annum per 1,000 average strength]

Theater or area	1942–45		1942		1943		1944		1945	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Continental United States	538	0.04	138	0.05	240	0.05	90	0.02	70	0.02
Overseas:										
Europe	36	.01	1	.01	--------	0	25	.01	10	.00
Mediterranean [1]	96	.06	3	.13	74	.16	14	.02	5	.01
Middle East	10	.07	--------	0	6	.11	4	.09	--------	0
China-Burma-India	11	.03	--------	0	3	.08	8	.05	--------	0
Southwest Pacific	73	.04	10	.14	5	.03	18	.03	40	.04
Central and South Pacific	38	.03	6	.04	9	.03	8	.02	15	.04
North America [2]	17	.03	5	.05	10	.03	2	.02	--------	0
Latin America	5	.01	1	.01	2	.02	2	.02	--------	0
Total overseas [3]	288	.03	26	.04	111	.07	81	.02	70	.02
Total Army	826	.03	164	.05	351	.05	171	.02	140	.02

[1] Includes North Africa.
[2] Includes Alaska and Iceland.
[3] Includes admissions on transports.

Military personnel, or potential military personnel, who have had acute trachoma and who have been pronounced cured should be examined in an Army hospital to determine if cure has been effected; if it is established that a cure has been effected, the individual should be allowed to enter into, or to continue, military service without jeopardy.

Because the number of cases will, in all probability, be small, each person should be considered on an individual basis, and there appears to be no need to establish a policy governing the actions of medical officers in the Army.

CHAPTER IX

Tularemia

Raymond A. Kelser, D.V.M., Ph. D.

During World War II, the Army's experience with tularemia was relatively insignificant. From 1942 to the end of 1945, only 194 cases were reported in military personnel; of these, 187 occurred in the continental United States, principally in the tick-infested regions of the Fourth and Eighth Service Commands, particularly in the Tennessee Maneuver Area. A few cases occurred among troops in the European, North African, and Mediterranean theaters. There were four deaths reported as being due to tularemia during the war years. With the exception of the issuance of warnings to avoid tick bites as much as possible and to avoid handling the carcasses of wild rabbits, no special control measures were applied or developed.

EPIDEMIOLOGY

The recognition of tularemia as a disease entity dates back to 1910 when McCoy[1] found it as a plaguelike infection of ground squirrels in Tulare County, Calif. The following year, McCoy and Chapin,[2] after a number of failures, succeeded in cultivating the organism on an egg-yolk medium, reproduced the disease with the cultures, and named the organism *Bacterium tularense*. Initially, it was not known whether the disease might be of importance insofar as man was concerned, or whether it was limited entirely to animals, particularly rodents. As is now well known, it was later established that the organism, which is now designated *Pasteurella tularensis*, is capable of infecting man, frequently with serious results.

Tularemia is primarily a disease of wild animals, especially rodents. It has been found commonly in rabbits, ground squirrels, wild rats, and mice, but it also occurs occasionally in opossums, grouse, sage hens, gophers, and so forth. It can be readily transmitted to laboratory animals such as the guinea pig, rabbit, and white mouse.

In 1914, Vail[3] proved the organism responsible for an eye condition

---

[1] McCoy, G. W.: A Plague-Like Disease of Rodents. Pub. Health Bull. 43: 53–71, April 1911.

[2] McCoy, G. W., and Chapin, C. W.: Further Observations on a Plague-Like Disease of Rodents With a Preliminary Note on the Causative Agent, *Bacterium tularense*. J. Infect. Dis. 10: 61–72, January 1912.

[3] Vail, D. T.: A Case of "Squirrel Plague" Conjunctivitis in Man (*Bacillus tularense* Infection of the Eye). Ophth. Rec. 23: 487–495, October 1914.

in man, and in the same year Wherry and Lamb[4] reported the case of a young man who developed ulcers on the conjunctiva and adenitis of the regional lymph nodes which was proved to be tularemia. Edward Francis[5] engaged in extensive studies of the organism and the disease it causes and contributed much to the knowledge of the subject. He demonstrated that the organism required cystine for its propagation on artificial media, and he coined the term "tularemia" to designate the several types of conditions caused by *Past. tularensis.*

Transmission of tularemia among lower animals most commonly occurs through the agency of arthropod vectors. While it is possible for animals to become infected by direct contact with those having the disease, insect transmission is more common. Man, on the other hand, is generally more likely to become infected through the handling of tissues from wild rabbits or other animals infected with the disease. This, of course, does not mean that arthropod vectors are of no importance in transmitting the malady to man; they are of importance and under some circumstances are of considerable importance in infecting man. It is of interest to note that for the most part the cases of tularemia which occurred among military personnel during World War II were tickborne (fig. 12).

The ticks *Dermacentor andersoni* and *Dermacentor variabilis* are well-known vectors of *Past. tularensis.* In these species, it is known that the organism can be passed from the adult female tick down through the eggs, larvae, and nymphs, thus giving rise to a large number of transmitting progeny. Moreover, the ticks are capable of harboring the organism of tularemia over long periods of time.

In the chief outbreaks of tularemia in military personnel in World War II, *Amblyomma americanum* was found to be the most predominant tick in the area in which the involved troops were bivouacked. Dr. Norman Topping, of the U.S. Public Health Service, who aided in the investigation of the outbreak in the Tennessee Maneuver Area, together with Maj. (later Lt. Col.) Ralph R. Sullivan, MC, Medical Inspector, Second U.S. Army, and Dr. Tucker, Epidemiologist for Tennessee, made an initial collection of ticks and found them to be *A. americanum.* Subsequently, a more extensive tick survey was made and was aided materially through the cooperation of Dr. W. C. Williams, Health Commissioner of Tennessee, and his staff. The ticks initially collected in the Tennessee Maneuver Area were examined by Dr. Edward Francis, in Washington, and subsequent lots by Dr. R. R. Parker and his group, at the Rocky Mountain Laboratory of

---

[4] Wherry, W. B., and Lamb, B. H.: Infection of Man With *Bacterium tularense.* J. Infect. Dis. 15: 331–340, September 1914.

[5] (1) Francis, E.: Tularaemia Francis 1921. Pub. Health Rep. 36: 1731–1753, July 1921. (2) Francis, E.: Tularaemia. Pub. Health Rep. 38: 1391–1404, June 1923. (3) Francis, E.: Microscopic Changes of Tularaemia in the Tick *Dermacentor andersoni* and the Bedbug *Climex lectularius.* Pub. Health Rep. 42: 2763–2772, November 1927. (4) Lillie, R. D., and Francis, E.: Bone Marrow in Tularaemia. Pub. Health Rep. 48: 1127–1136, September 1933. (5) Francis, E.: Tularaemia Francis 1921; A New Disease of Man. U.S. Hyg. Lab. Bull. No. 130, March 1922.

FIGURE 12.—Tularemia lesion following tickbite observed in soldier at Army-Navy General Hospital, Hot Springs, Ark.

the U.S. Public Health Service, at Hamilton, Mont. None of the ticks collected were found to be infected with *Past. tularensis.*

Until the time of the Tennessee Maneuver Area outbreak, *A. americanum* generally was not considered a vector of the tularemia organism. However, according to a report by Parker in 1933,[6] Philip had demonstrated experimentally the survival and transmission of *Past. tularensis* by *A. americanum* from the larval stage to the adult stage in one generation. Epidemiological observations and studies with tularemia since the experience with *A. americanum* during World War II have strengthened the concept that the *Amblyomma* species is a natural vector of *Past. tularensis.* Philip has called attention to his own experiences in Texas, Arkansas, and Oklahoma and to that of his colleague, Brennan, in Arkansas and Oklahoma, in which the evidence is strong that *A. americanum* is a natural vector in tularemia. Finally, Hopla [7] has recently reported finding this tick in Arkansas naturally infected with *Past. tularensis.*

The horsefly, or deerfly, *Chrysops discalis*, is quite well known for its ability to transmit tularemia. A condition in man, observed years ago in Utah and associated with the bite of the deerfly, was referred to locally as "deerfly fever" but proved to be tularemia.

Aside from ticks and flies, other bloodsucking insects, such as lice and fleas, are capable of causing infection with *Past. tularensis.*

One of the notable characteristics of *Past. tularensis* is its ability to infect through the skin if there is the slightest amount of irritation of the epidermis. Indeed, the organism's capability in this respect is such that some investigators go so far as to ascribe to the bacterium the ability to infect through the unbroken skin.

Tularemia is well known as a disease which occurs in the United States, but it has also been reported from various other localities, including Mexico, Canada, several countries in Europe, and Japan. It is probably more widely distributed than published records indicate.

CLINICAL DESCRIPTION

The clinical picture of tularemia may assume one of several forms. The most common type consists of an initial local lesion which first appears as a skin papule that later ulcerates and is accompanied by enlargement, and sometimes suppuration, of the regional lymph glands. This form of the disease has been referred to as the ulceroglandular type. In some instances, tularemia infection is found to be confined to a group of lymph nodes in the area of initial entry of the organism but in which no frank, primary lesion occurs. This is generally spoken of as the glandular form of the malady. Tularemia in man may also begin as a conjunctivitis with subse-

---

[6] Parker, R. R.: Proc. Fifth Pacific Science Congress, p. 3371, 1933.

[7] (1) Hopla, C. E., and Downs, C. M.: The Isolation of *Bacterium tularense* From the Tick, *Amblyomma americanum.* J. Kansas Ent. Soc., Vol. 26, April 1953. (2) Hopla, C. E.: Experimental Studies on Tick Transmission of Tularemia Organisms. Am. J. Hyg. 58: 101–118, July 1953.

quent involvement of the regional lymph nodes. This form has been designated as the oculoglandular type. The fourth type is one in which there is a general systemic infection without a primary local lesion or glandular enlargement. This is characterized as the typhoid form. Finally, there occasionally occurs a pneumonic type of tularemia which may start as an initial condition or may follow one of the other forms, especially the so-called typhoid type. Pulmonary involvement in tularemia, particularly if it is bilateral, ordinarily has a relatively high mortality rate.

INCIDENCE

There were 194 cases of tularemia recorded in the Army during the years 1942 to 1945, inclusive (table 14). For the 4-year period, the annual rates per 1,000 average strength were 0.01 for the total Army and the United States, and less than 0.005 for oversea theaters. The total Army annual rates were 0.01 for each year except 1945, which had a rate of less than 0.005. Among troops in the United States, the annual rates were 0.01 in each year except 1943, in which the rate was 0.02. All but 7 cases occurred in troops in the United States, principally in the Fourth and Eighth Service Commands. One case occurred in Alaska in 1942 and one in the Philippine Islands in 1940.

TABLE 14.—*Number of cases of tularemia in the U.S. Army, by theater or area and year, 1942–45*

[Rate expressed as number per annum per 1,000 average strength]

Theater or area	1942–45	1942	1943	1944	1945
Continental United States	187	18	94	50	25
Overseas:					
North America	1	1			
Europe	5				5
Mediterranean	1			1	
Other areas					
Total overseas	7	1		1	5
Total Army	194	19	94	51	30

Tennessee Maneuver Area experience.—The largest single outbreak of tularemia in the military establishment during World War II occurred during the period from March to December 1943, in the Tennessee Maneuver Area. This outbreak consisted of 50 cases with 1 fatality. In classifying these cases, 35 were recorded as the ulceroglandular type, 11 as a pulmonic type, 3 as a glandular type, and 1 as a mixed ulceroglandular and pulmonic form.

In 32 of the 50 cases, the patients gave a definite history of having had tick bites prior to the onset of illness. There were five who gave histories of having skinned, or otherwise had direct contact with, wild rabbits. The remaining 14 had no knowledge of having received tick bites and had no contact with wild rabbits or their tissues. It should be noted, however, that all of these men were in an area known to be highly tick infested. Consequently, it is reasonable to conclude that ticks were responsible for their infection.

Tick collections made in the Tennessee Maneuver Area in the summer of 1943 revealed that the predominating species was *A. americanum*. All the evidence points to this species as the important transmitting agent in this particular outbreak.

In those cases in which there were definite histories of tick bites, symptoms were reported as developing in from 1 to 21 days. The onset of the disease was acute in about one-half of the cases. Primary ulcers were recorded in 40 of the 50 cases. These were located on the arms, hands, lower extremities, buttocks, abdomen, scapular region, and perineum. Most of the patients had but one ulcer.

The symptoms characterizing these cases included fever of from 101° to 105° F.; headache; chills; generalized aching, more pronounced in the lower extremities and lumbosacral region; profuse sweats; painful lymph nodes; abdominal pains; marked weakness; severe prostration; nausea; dizziness; unproductive cough; and anorexia. Several of the more seriously ill patients had periods of delirium. In the pulmonary type, unproductive cough, chest pains, and dyspnea were prominent findings. A maculopapular eruption was present in a few of the cases. This involved the entire body but was most pronounced on the extremities. Pleural effusion developed in 9 of the 11 individuals with pulmonary cases, and, of those who had the ulceroglandular type, 2 developed a fibrinous pleurisy, and 3 developed pleural effusions. In all cases in which a local, primary lesion was found, there was enlargement of the regional lymph nodes. Adenitis was also observed in several cases in which there were no primary ulcers.

The course of the disease in these cases extended over a period of several weeks, and convalescence was protracted. A number of the patients were hospitalized for periods of from 3 to 6 months.

In the one fatal case, a soldier was admitted complaining of generalized aching, headache, sweating, fever, abdominal pain resembling colic, and diarrhea. Physical examination indicated an acutely ill but oriented individual with temperature of 103.6° F. and marked tenderness over the right costovertebral angle. The leucocyte count was 10,700, and urinalysis gave a 3+ albumin reading. Three days later, he developed an unproductive cough, pain in the right chest on inspiration, cyanosis, and dyspnea. Physical examination and radiologic study revealed evidence of consolidation in the right lower lobe and a widened mediastinum. The process rapidly pro-

gressed and extended, involving both lungs, and a relatively large amount of pleural effusion developed in the left chest. The patient became delirious, the dyspnea and cyanosis increased, and death followed on the 10th day after onset of symptoms. Autopsy revealed extensive pneumonic involvement, with areas of necrosis and caseation. There was approximately a liter of cloudy, straw-colored fluid in the left chest. The mediastinum contained large masses of enlarged lymph nodes. These were purplish black in appearance and, while generally firm, contained areas of necrosis and caseation. The liver and spleen were greatly enlarged and contained areas of necrosis, and the liver revealed frank abscess formation.

The clinical diagnoses in the Tennessee Maneuver Area cases were confirmed by agglutination tests. Titers ranged from 1:320 to 1:10,240.

The treatment was symptomatic and supportive. The sulfonamides and antibiotics then available were of no demonstrable value.

The Medical Department of the Army took advantage of the occurrence of tularemia among troops in the Tennessee Maneuver Area to test, to a limited extent, various insect repellents then available, with a view to determining whether or not they were of value in preventing tickborne infections. The agents tested were dimethyl phthalate (Insect Repellent No. 612), Indalone, and the official Army louse powder. No evidence was obtained that any of these repellents were of value for the purpose.

LABORATORY DIAGNOSIS

For the specific diagnosis of tularemia, use is made of serologic tests, bacteriologic procedures, and the inoculation of guinea pigs, rabbits, or mice.

The blood agglutination test is valuable and is the procedure chiefly relied upon for diagnosis. The fact must be borne in mind, however, that serums from patients with tularemia may give cross-agglutination reactions with antigens prepared from *Brucella abortus* and *Brucella melitensis*. In tularemia, the agglutinins make their presence in the patient's blood about the second week of the infection, and the titer usually rises to its highest level between the third and eighth week. Generally, an agglutination titer of 1:80 or higher is regarded as diagnostic of the disease, especially if the titer continues to rise as the disease progresses. Some cases develop titers ten to a hundred, or even a thousand, times that considered as the lowest for positive diagnosis. In cases of infection with *Brucella* species, the agglutination titer with *Past. tularensis* antigen is lower and the reaction occurs less rapidly, as compared to serums from individuals suffering from tularemia.

While in some instances *Past. tularensis* may be isolated in culture directly from the blood, local lesions, lymph nodes, pleural effusions, sputum, and so forth, of patients, failures are the common experience in these procedures.

In carrying out animal inoculation tests, guinea pigs, rabbits, or mice are inoculated subcutaneously or intraperitoneally with material from the primary

lesion, regional lymph node, pleural effusion, sputum, or blood. In positive cases, the test animal usually succumbs within a week. Autopsy will reveal a hemorrhagic edema at the point of inoculation, enlargement and caseation of the lymph nodes, and the characteristic, small, necrotic focuses in the spleen and liver ("pepper-and-salt" liver). By use of a glucose-cystine-blood-agar culture medium, *Past. tularensis* may be recovered from the blood, liver, and spleen. The initial growth usually appears on the culture medium in about 3 days. Subcultures grow more rapidly and more luxuriantly.

A skin test using a detoxified preparation (Tularin) made with *Past. tularensis* has been reported of value for the diagnosis of tularemia. It is indicated that positive reactions can be obtained as early as the 3d or 4th day of the disease, which is several days earlier than an agglutination reaction may be expected. This intradermic test appears to be of considerable value but apparently has not been widely used.

THERAPY

As previously mentioned, the treatment of the tularemia cases which occurred in the Army during World War II was largely symptomatic and supportive. The sulfonamides and penicillin were used in a number of the cases, but there was no evidence that these agents possessed any specific value in the treatment of the disease. There is nothing in the records to indicate that specific serum, such as that developed by Foshay, was available or used in any of the cases which occurred among military personnel. Streptomycin, which is now considered specific treatment for tularemia, of course, was not available during World War II.

559625ᵛ—61——11

CHAPTER X

Venereal Diseases [1]

Thomas H. Sternberg, M.D., Ernest B. Howard, M.D., Leonard A. Dewey, M.D., and Paul Padget, M.D.

Part I. Zone of Interior

SIGNIFICANT POLICIES IN PREVENTION AND CONTROL

On 31 May 1912, the War Department published General Orders No. 17 containing specific measures for venereal disease control. This directive was based on evidence and data collected between 1900 and 1912, particularly during the last 4 years of the period. Among the measures ordered were those providing for compulsory prophylaxis, disciplinary measures, physical inspections, education, and early treatment. The introduction of these practices was followed by a decline in venereal disease rates which continued, except for the period of World War I, until the eve of World War II.

The advent of World War II saw the expansion of existing measures, the elimination of some, and the introduction of important new policies and practices. These changes were predicated by the monumental expansion of the Army and its wide dispersion throughout all parts of the world. Many of the most difficult problems were geographic in nature, due to differences in mores, cultures, and public health consciousness of the various countries

---

[1] This chapter attempts to present the Army's experience in the prevention and control of venereal diseases from the beginning of mobilization in 1940 to the termination of World War II and during the immediate postwar period. The task of compilation has been extremely difficult because of the immensity of the Army venereal disease program, concerned as it was with 8 million or more men and women in service scattered over most of the areas of the world. Details of the treatment of venereal diseases, venereal disease education, and venereal disease activities in civil affairs and occupied areas are not fully discussed. As it was apparent, however, that none of these subjects could be completely divorced from prevention and control activities, they have been mentioned within the framework of the chapter. A detailed account of the treatment of venereal diseases during World War II will appear in volume II, Internal Medicine in World War II [in preparation]. The account of venereal disease education will be integrated into the chapter on health education in preventive medicine, in volume IX of the series Preventive Medicine in World War II [in preparation], and the handling of venereal disease problems in connection with civil affairs and in the occupation of liberated countries will be specifically considered in volume VIII of the same series [also in preparation].

Every effort was made to document this history. However, since the authors were either directly concerned with the making of policy and with operational procedures in the Office of the Surgeon General or were in charge of venereal disease control activities in the theaters of operations concerning which they have written, parts of this chapter were based on personal knowledge of methods and results. Some portions of the chapter dealing with problems in oversea areas were written by officers not directly connected with activities in the areas concerned. In such instances, the material was prepared from reports of those who had taken part in the activities recorded.

which the Armed Forces of the United States entered. Changes in the basic philosophy governing control measures manifested themselves in corresponding changes of policy such as the elimination of punishment for those acquiring a venereal disease, an increased emphasis on informing and educating the soldier on the venereal diseases, and an extensive contact-tracing program which was designed to cure and rehabilitate. Enlightened public opinion and ever-increasing interest in the venereal diseases by the population at large contributed to the firm and unequivocal stand which the Army took with respect to prostitution—that of suppression. The all-out nature of World War II required, more than ever, close cooperation and collaboration among the Army, civilian agencies and organizations, and the community in order to effect complete control. Finally, of utmost importance in bringing about changes in policies and practices was the discovery of new drugs and the innovation of new methods of treatment.

The Basis for Civil-Military Cooperation

It was recognized in World War I that a successful venereal disease control program required a joint effort by numerous agencies. In that war, the U.S. Public Health Service and the American Social Hygiene Association played particularly prominent roles in the control of venereal diseases. Civilian communities, especially in the extracantonment areas, launched extensive programs including the suppression of prostitution, venereal disease education, and improvement of epidemiological and treatment facilities. Unfortunately, with the close of the war interest lagged and the entire civilian program lapsed into a long period of relative quiescence which did not end until 1937, when Dr. Thomas Parran, Surgeon General, U.S. Public Health Service, published "Shadow on the Land: Syphilis." This book provided the impetus for the reestablishment of a vigorous venereal disease control program in most of the States. With the allocation of Federal funds through the La Follette-Bulwinkle Act of 1938, the State health departments organized venereal disease control programs. As the growth of the Nazi power forecast World War II, the military services, the U.S. Public Health Service, and the American Social Hygiene Association, recalling their joint action in World War I, met to establish plans for another collaborative effort. Out of these conferences emerged a joint resolution formally titled "An Agreement by the War and Navy Departments, the Federal Security Agency, and State Health Departments on Measures for the Control of the Venereal Diseases in Areas Where Armed Forces or National Defense Employees are Concentrated" (appendix B). The resolution was more commonly known as the Eight-Point Agreement. The agreement was adopted by the Conference of State and Territorial Health Officers, 7–13 May 1940. It was promulgated to the Army by The Adjutant General in a letter dated 19 September 1940.

Throughout the war, with minor exceptions, the close liaison and cooperative relationship established by this agreement between the Army, the U.S.

Public Health Service, the American Social Hygiene Association, and, later, the Social Protection Division of the Federal Security Agency operated effectively to produce an integrated civilian venereal disease program.

War Department policy.—The policy of the War Department throughout the war was the repression of commercialized prostitution. The aforementioned letter, published by the War Department on 19 September 1940, called the attention of commanding officers to this policy and directed their adherence to it. On 16 December 1940, another letter was issued by The Adjutant General enjoining commanding generals of all armies, corps areas, and departments to declare areas off limits for members of their command whenever local authorities failed to cooperate by eliminating conditions inimical to the health and welfare of the troops. Upon receiving information that certain medical officers were examining inmates of houses of prostitution as a protective measure in safeguarding enlisted personnel against venereal disease, Maj. Gen. James C. Magee, The Surgeon General, directed that a letter be addressed to surgeons of major headquarters to correct any misunderstanding or ignorance of War Department policy on the part of medical officers and their commanders.[2] This letter stated that because of these actions the War Department had been misrepresented as condoning the commercialization of prostitution. Attention was directed to the two aforementioned letters, and The Surgeon General's policy was made clear and explicit in the following statement: "It is recognized by those interested in public health that the attempted segregation and regulation of prostitution is of no public health value. Also, those interested in public health appreciate that in any attempt to control venereal disease unrelenting war must be waged on prostitution and the criminal exploiters of prostitutes."

Despite these early, vigorous, and clear-cut directives by the War Department, a few line officers still seemed to misunderstand the attitude of the War Department and passively or actively supported commercialized prostitution activities in many civilian communities. In an effort to correct the attitude of these officers and to forestall adverse public opinion, a very strong Army-wide directive[3] was published. This referred to the lack of uniformity with respect to the enforcement of War Department policies governing the improvement of moral conditions in the vicinity of camps and stations. Reference was made in this directive to the letters that had been published previously on the subject of prostitution, and commanding officers were again forcefully directed to take every measure in support of local civilian agencies to suppress prostitution activities. This directive further stated: "* * * Local officials will not be encouraged in any respect either directly or indirectly in

---

[2] Letter, Col. Larry B. McAfee, MC, Executive Officer, Office of the Surgeon General, to the Surgeons of all Corps Areas, Departments, and Independent Stations, 13 Jan. 1941, subject: Cooperation With the U.S. Public Health Service in the Control of Venereal Diseases.

[3] Letter, The Adjutant General to Commanding Generals of all Corps Areas, Departments, Armies, GHQ Air Force, Armored Force; the Chiefs of all Arms and Services, and the Commanding Officers of Exempted Stations, 22 Mar. 1941, subject: Improvement of Moral Conditions in the Vicinity of Camps and Stations.

non-enforcement of these laws and regulations and under no circumstances will military personnel or civilian personnel under military control be permitted to make inspections of any character of houses of prostitution."

In addition to this formal directive, the Chief of Staff sent a personal letter to all corps areas and Army commanders in which he said:

> The Adjutant General is sending to all appropriate commanders a formal letter on the subject of moral conditions in the vicinity of Army camps and stations in which he summarizes the War Department's policy. Recently these policies have frequently been misquoted. A few weeks ago, for example, an ill-advised statement resulted in the impression becoming current that the War Department advocated segregated districts in the vicinity of Army camps. We were immediately subjected to a barrage of protests.
>
> It will be extremely serious if our attitude on such questions is misunderstood, or if we lay ourselves liable to criticism either for lack of tact or lack of firmness in our dealing with civil health officers. The entire subject is too important to be treated as routine and it demands a uniform adherence to War Department policy. For this reason I am bringing The Adjutant General's letter informally to your personal attention and to that of the other commanders who will receive it.

The May Act.—By late 1940, it was becoming increasingly evident that local law-enforcement facilities for the repression of prostitution were inadequate in many communities. Recommendations, suggestions, and even exhortations by members of the Army and the Navy, the U.S. Public Health Service, and other organizations concerned with the problem were, in many cases, to no avail. There was no way to put teeth into their suggestions. These agencies, civil and military, were most ineffective in areas where the conditions were most deplorable. It was at this juncture that Congressman Andrew J. May, chairman of the House Committee on Military Affairs, on 20 January 1941, introduced in the House of Representatives a bill designed to suppress prostitution in extracantonment communities through Federal agencies, when local law-enforcement agencies were unable to achieve such suppression. This bill, H.R. 2475, was supported by the Army, Navy, and American Social Hygiene Association and was also the result of spontaneous congressional sentiment. On 3 March 1941, Congressman May wrote to Maj. Gen. James C. Magee, The Surgeon General, requesting his presence as a witness in support of the bill, if he favored it. Congressman May went on to say that if General Magee found it impossible to attend in person, he would be happy to accept a written statement from The Surgeon General which could be incorporated into the record. The Surgeon General replied to Congressman May by letter on 7 March 1941, agreeing with the purpose of H.R. 2475. Among the reasons given for agreeing with the bill were the following: Statistically, venereal disease was at that time the greatest single cause of noneffectiveness in the Army; disability and loss of efficiency resulting from this cause were completely preventable by means available; the source was at the time always to be found in the civilian population and lay without military jurisdiction; three-fourths of all venereal infections among Army personnel could be traced to infected prostitutes; and, during recent months, the

control of prostitution in extracantonment areas had appeared as a major problem confronting camp and station commanders.

The bill was officially titled "The May Act" (appendix C) and became law on 11 July 1941. Described as an act to prohibit prostitution within such reasonable distance of military and/or naval establishments as the Secretary of War or the Secretary of the Navy or both should determine to be needful to the efficiency, health, and welfare of the Army and/or Navy, it became more than the policy of the armed services: it was national policy.

Removal of Punishment for Acquiring Venereal Disease

The most important change in basic policy in connection with venereal disease control within the Army during World War II was the removal of punishment for acquiring a venereal disease. On 18 January 1943, The Surgeon General recommended to The Adjutant General that the law prescribing loss of pay or time for acquiring a venereal disease be repealed. The change recommended by this letter was revolutionary. It ran directly counter to established Army policy and conflicted with the opinion of numerous Army officers, particularly line officers. On no other issue revolving around the venereal diseases was opinion within the Office of the Surgeon General so divided. Those having experience with these diseases in civilian life were generally in favor of the change, while many of the more experienced medical officers remained unconvinced of its desirability. The question still occasionally enters the realm of controversy.

The basis for this punishment of individuals who contracted venereal disease lay in the act of the 69th Congress, first session, chapter 302, section 2, 17 May 1926 (44 Stat. 557; 10 U.S.C. 847b; ML 1939, sec. 1442) and was founded on the premise that disciplinary measures and loss of pay were deterrents to exposure on the part of military personnel to venereal diseases. It was becoming increasingly clear, however, that this act was not achieving the objectives for which it was designed.

Brig. Gen. David N. W. Grant, Air Surgeon, Army Air Forces, wrote to The Surgeon General on 19 November 1942 stating that the application of this act was of particular concern to the Air Forces. It had led to the development of situations more dangerous than the venereal diseases themselves. Flying personnel were concealing the fact that they had contracted a venereal disease and, in spite of directions to the contrary, were flying while receiving clandestine treatment involving the extensive use of sulfa drugs. The Air Forces had reason to believe that sulfa drugs affected the skills involved in flying and no one receiving arsenical drugs was permitted to fly. The Air Surgeon cited the case of a flying officer whose death could reliably be attributed to anoxemia caused by the presence of methemoglobin resulting from the promiscuous use of sulfanilamide. The Air Surgeon mentioned that a survey of private physicians in the vicinity of Hunter Field, Savannah, Ga., revealed that they were treating more cases of venereal disease than the

station surgeon. He strongly recommended that the Army regulations enforcing the act be rescinded in order to save the cost of concealed infections to the Air Forces in men, planes, time, and disruption of training and tactical service, and in order to improve the health, efficiency, and safety of personnel.

On 13 January 1943, Brig. J. C. Meakins, Department of National Defense, Canada, writing to Lt. Col. (later Col.) Thomas B. Turner,[4] Chief, Venereal Disease Control Branch, Office of the Surgeon General, noted that the Canadian Armed Forces had discontinued hospital stoppages (loss of pay) for venereal disease since 15 May 1942. This action had been taken, continued Brigadier Meakins, to prevent the concealment of infection, and because of the considerable and increasing proportion of cases of nonspecific urethritis admitted to hospitals (particularly overseas), for which hospital stoppages could not have been made as a diagnosis of gonorrhea had not been readily possible. Brigadier Meakins attributed these findings largely to the increasing use of sulfa drugs with the object of concealment, and he maintained that punishment of only certain confirmed cases amounted to unfair discrimination.

The Subcommittee on Venereal Diseases of the National Research Council had on two occasions recommended repeal of the law. The minutes of its eighth meeting, held on 20 September 1940, contained the following statement:

> In order to further the control of the venereal diseases, all provisions relating to forfeiture of pay and/or loss of time in the U.S. Army, Navy, Coast Guard and Public Health Service personnel infected with any venereal disease, whether or not such personnel is therefore absent from duty, and whether such disease was contracted at any time before or after entry into the services, should be forthwith repealed.

This statement was reiterated in recommendations made at the 16th meeting of the subcommittee held on 24 July 1942. Since the abolition of the act of 17 May 1926 would require an act of Congress, the subcommittee had also recommended at its seventh meeting on 6 September 1940 that the American Social Hygiene Association be requested to draw up a bill embodying provisions for repeal of the law and to discuss it with the Surgeons General of the Army, the Navy, and the U.S. Public Health Service, as well as with the Secretaries of War and the Navy and with the Federal Security Administrator, preliminary to its submission for congressional action.

On 10 August 1942, Dr. Joseph E. Moore,[5] Chairman of the Subcommit-

---

[4] Colonel Turner was director of the Venereal Disease Control Division, Preventive Medicine Service, early in the war and was directly responsible for most of the policies adopted. His keen knowledge of public health methods and his untiring efforts and tactfulness made many things possible which might otherwise have failed.—T. H. S.

[5] Dr. Moore served as chairman of the Subcommittee on Venereal Diseases, National Research Council, throughout the war and as consultant to the Venereal Disease Control Division, Preventive Medicine Service, and The Surgeon General. Dr. Moore and the Subcommittee on Venereal Diseases never failed to respond to the call for help in all matters concerning venereal disease control and treatment. In addition, Dr. Moore was always available, day or night, for special consultation and made several trips to oversea theaters during the course of the war in response to special needs for his services. At the conclusion of the war, the President of the United States awarded Dr. Moore the highest civilian decoration, the Medal for Merit, for his great and unselfish patriotism and service.—T. H. S.

tee on Venereal Diseases of the National Research Council, gave his personal views on the topic in a letter to Col. (later Brig. Gen.) Hugh Morgan, MC, Division of Professional Services, Office of the Surgeon General, in answer to a request by Colonel Morgan for more information on which to base a recommendation for the abolishing of penalties for venereal diseases. Dr. Moore also stressed the fact that fear of future punishment did not prevent exposure to venereal diseases and actual punishment following their acquisition succeeded only in promoting their concealment and spread. He commented on the fallacy of classifying venereal disease as due to misconduct. It appeared to him that the soldier who acquired a venereal disease was no more guilty of misconduct than his more fortunate brother who, by sheer good luck or the use of prophylaxis, escaped. This matter of good and bad luck was also mentioned in connection with the loss of pay. The more fortunate man whose course was uncomplicated was treated on a full-duty status and lost no pay, whereas the more unlucky fellow, who through no fault of his own was incapacitated by the disease or by reaction to the treatment, was penalized. The effect of this law which was of primary concern to Dr. Moore was the fact that concealment of disease fostered spread of disease. A soldier who attempted self-treatment of venereal disease or received inadequate treatment from untrained civilian physicians was much more likely to infect other civilian women who in turn would infect additional soldiers. Dr. Moore stated that any public health measure which promoted the concealment of disease and thereby fostered the spread of that disease resulted in the ultimate disadvantage of both the civilian community and the Army. Dr. Moore also apprised Colonel Morgan of many specific instances found by members of his Subcommittee on Venereal Diseases wherein the venereal disease control program was adversely affected by the law in question.

The memorable letter of 18 January 1943, in which The Surgeon General recommended to The Adjutant General repeal of the act of 1926, was prepared by Colonel Turner with the close collaboration of Colonel Morgan. The writers used freely the advice and opinions of those mentioned above and, in addition, set forth at length the results of the Army's experience with the law. The highlights of the argument for its repeal are summarized in the following paragraphs:

1. With respect to the concealment of disease, self-treatment, and treatment by nonmilitary personnel, these practices usually mean inadequate and ineffective treatment, more frequent resistant cases and relapses, unnecessary loss of manpower, and a resultant increase in the spread of the disease.

2. The law is obviously unjust in that individuals differ in their reaction to treatment. Diagnosis is difficult and often impossible when just a few doses of sulfa drugs are taken. Furthermore, unlucky persons are branded with the stigma of being diseased due to misconduct, while others who escape are not. It is particularly unjust when an individual is liable to be punished if he fails to report the contracting of a venereal disease, is also absolutely

559625v—61——12

certain of receiving punishment if he does report, and is removed from duty while being treated. In addition to being unjust, the law also places the Army in a most incongruous position concerning inductees entering the service with a venereal disease. The Army accepts an inductee as qualified for military duty and then immediately hospitalizes him and under law deprives him of his pay. Moreover, in such instances, it is impossible to determine whether or not the infection is the result of misconduct inasmuch as the disease was contracted at a time when the inductee was not under military control.

3. The presence of this law influences the attitude taken on this whole subject, with undesirable side effects. For example, in some organizations, reduction in grade is made mandatory for noncommissioned officers who acquire venereal disease. The Army can ill afford to penalize itself by restricting the usefulness of men whose training may represent large investments in time and money and whose services are greatly needed.

4. When men are taken from the relative safety of their home environment and placed in situations where the risk of venereal infection is many times as great, the Government should be ready to assume a share of the responsibility, just as it has always done in the case of other diseases.

5. The advent of new drugs for the treatment of gonorrhea has materially shortened the course of the disease. Therefore, the monthly venereal disease inspection provided in Army Regulations No. 615-250 is inadequate to prevent concealment since the only cases of gonorrhea that are likely to be discovered are those which have recently developed or those which have not responded to treatment from unauthorized sources.

On 27 September 1944, Congress enacted a bill repealing the provision included in the act of 17 May 1926 which provided for loss of pay for acquiring a venereal disease. War Department Circular No. 458, 2 December 1944, effected this change within the Army.

Responsibility for Treatment of Venereal Disease

Transfer of responsibility within the Office of the Surgeon General.—During the early administration of the venereal disease control program, the treatment of venereal disease was a responsibility of the Medical Consultants Division. However, because of the desirability of centralizing the responsibility for all phases of venereal disease control, Brig. Gen. Charles C. Hillman, Chief, Professional Services, recommended to The Surgeon General on 3 November 1942 that the treatment phase of venereal disease control be transferred to the Venereal Disease Control Branch of the Preventive Medicine Division. It was believed that such a change would serve to bring about a desirable unification of the venereal disease control program. The prevailing divided responsibility often resulted in uncertainty as to which office should initiate action or make decision on proposals reaching the Office of the Surgeon General. The situation thus created lent itself to inattention to or

delay in the proper handling of matters of policy. It was suggested that the proposed change would in no way disturb the excellent working relationship between the Venereal Disease Control Branch and the Medical Practice Division, nor render any less readily available the help and advice of members of the latter Division. General Hillman further stated that the treatment of venereal disease was now highly routinized and that a majority of the problems presented were those concerned with administrative procedures incident to the handling of large numbers of venereal disease patients rather than with the more complex aspects of professional care. It was also proposed that a treatment section be added to the Venereal Disease Control Branch. These recommendations were favorably considered, and the Treatment Section, Venereal Disease Control Branch, was established on 12 November 1942 by Office Order No. 466. Maj. (later Col.) Thomas H. Sternberg, formerly Venereal Disease Control Officer, First Service Command, was assigned as the first chief of this section.

Determination of treatment responsibilities in the field.—The responsibility of venereal disease control officers in the field had never been clear with respect to the treatment of venereal disease. Conflict occasionally occurred between the medical consultant assigned to service command headquarters and the venereal disease control officers. In an effort to clarify this jurisdictional problem, the War Department published a memorandum [6] directing that the service command venereal disease control officer serve as principal advisor to the chief of the medical branch in all matters relating to venereal disease, including treatment as well as prevention. The memorandum further directed that full utilization be made of such added advice and assistance as might be rendered by the consultant in medicine in problems pertaining to the professional care of patients with venereal disease. Following the announcement of this policy, the problem was resolved satisfactorily in most instances by the establishment of joint inspectorial and consultative duties. The venereal disease control officer directed his surveys toward treatment procedures with particular emphasis upon duty-status treatment and the followup of syphilitic patients. The medical consultant directed his study to therapeutic practices in the hospital.

Induction of Individuals With Venereal Disease

In the early period of mobilization, persons known to have venereal disease were rejected for military service mainly because the facilities and personnel then available were inadequate to cope with the problems resulting from their induction. This policy resulted in the accumulation of a large backlog of rejected syphilitics, recognized by all concerned as a potential manpower reservoir which could be drawn upon at the earliest practical moment to fill Selective Service quotas. A similar situation did not develop

---

[6] Memorandum, The Surgeon General for Commanding Generals of each Service Command, attention: Chief, Medical Branch, 19 Nov. 1942, subject: Venereal Disease Control Officer.

in individuals suffering from gonorrhea or chancroid since Selective Service Boards classified them as 1A until asymptomatic and then referred them for induction. Early in 1942, the Army training program appeared sufficiently advanced and the administrative and professional procedures well enough organized to provide diagnostic and treatment facilities necessary for the induction of men currently infected with, as well as men previously deferred because of, venereal disease. Accordingly, the Office of the Surgeon General initiated and developed the necessary plans, and The Adjutant General issued two radiograms to all service commands. The first of these, dated 7 December 1942, authorized the induction of registrants with uncomplicated venereal disease. The second, dated 10 December 1942, defined the types of venereal disease with which men could be inducted and provided regulations for the rate of induction of these individuals so that existing facilities for their management would not be overtaxed.

Mobilization regulations were revised to include authorization to induct all selectees with uncomplicated gonorrhea, syphilis (except cardiovascular syphilis, neurosyphilis, or other forms of visceral syphilis), and chancroid. Individuals with active lesions of granuloma inguinale or lymphogranuloma venereum were rejected. To assure the preinduction rejection of registrants with an abnormal spinal fluid, The Adjutant General, on 9 June 1943, authorized the commanding generals of all service commands to hospitalize for spinal-fluid examination all registrants with a positive serologic test for syphilis. Previously, registrants with a positive serologic test for syphilis had been inducted before a spinal-fluid examination had been made. As a result, individuals with an abnormal spinal fluid had to be put through the lengthy, time-consuming procedure involved in obtaining a certificate of disability discharge. The economy of this move was tremendous, considering the fact that from 15 to 20 percent of apparently latent syphilitic registrants were found to have abnormal spinal fluid.

An immediate effect of the Army's induction of syphilitic registrants was to relieve civilian health departments of a large part of their syphilis treatment load. The Army benefited by obtaining a large number of individuals suitable for military service at a time when the manpower situation was acute.

ORGANIZATION AND PROGRAMS, OFFICE OF THE SURGEON GENERAL

In 1940, the venereal disease program was still administered by the Subdivision of Preventive Medicine, and no specific officer was assigned to carry out venereal disease control duties. The activities consisted primarily of maintaining the syphilis registers of the Army and conducting the voluminous correspondence connected with them. However, the increase in active participation by The Surgeon General in the national program for the control of the venereal diseases required increasingly greater amounts of correspondence and necessitated many time-consuming conferences with venereal disease con-

trol offices of the U.S. Public Health Service, the National Research Council Advisory Committee, the American Social Hygiene Association, and other organizations. Consequently, when the Subdivision of Preventive Medicine, Office of the Surgeon General, became the Preventive Medicine Division by Office Order No. 87 of 18 April 1941, the Venereal Disease Control Subdivision was created as a part of this new division. The functions of the new Venereal Disease Control Subdivision included developing Army policies in matters pertaining to the control of venereal disease, analyzing and recording venereal disease reports, collecting and filing syphilis registers of all cases in the Army and the Civilian Conservation Corps, effecting a periodic followup on "cured" cases of syphilis, preparing recommendations as to the management of individual problem cases, and maintaining liaison with other governmental and civilian venereal disease control agencies. Capt. (later Col.) James H. Gordon, MC, was assigned as the first chief of this new subdivision.

Toward the end of 1941, it was apparent that the Venereal Disease Control Subdivision could not carry out its functions successfully without the assignment of additional trained personnel. On 29 December 1941, in a memorandum to Col. (later Brig. Gen.) James S. Simmons, MC,[7] Chief, Preventive Medicine Service, Office of the Surgeon General, Captain Gordon recommended the addition of one field grade officer trained and experienced in the clinical and public health aspects of venereal disease control, a trained statistician (officer or civilian) with experience in venereal disease statistics, and an appropriate increase in the number of civilian clerks. In addition, he recommended that additional facilities be provided for statistical studies, informational service, and research.

The Venereal Disease Control Division.—The Office of the Surgeon General was reorganized in March 1942. At this time, the Preventive Medicine Division became the Preventive Medicine Service, thus elevating the Venereal Disease Control Subdivision to a division. The internal organization and functions of the Venereal Disease Control Division established at the time of this reorganization prevailed to a substantial degree through the remainder of the war years. From time to time the division changed status, alternating between division and branch status as changes took place in the organization of the Office of the Surgeon General, but these changes affected little the internal organization of the Venereal Disease Control Division.

The Venereal Disease Control Division was primarily a policymaking and planning group with very few administrative or supply functions. In carrying out its mission, liaison with other divisions and services of the Office of the Surgeon General, other branches of the Army, and other governmental and civilian agencies constituted a major portion of its activities. Members of the division were in frequent contact with the various staff sec-

---

[7] General Simmons (deceased), Chief, Preventive Medicine Service, Office of the Surgeon General, made many original and effective contributions to the development and carrying out of the venereal disease control program and in connection therewith bore heavy responsibilities.—T. H. S.

tions of the Services of Supply, the Army Ground Forces, and the Army Air Forces, as well as with the General Staff, itself. Representatives of the division were in almost daily contact with the U.S. Public Health Service, the Division of Social Protection of The Office for Emergency Management (later of the Federal Security Agency), the American Social Hygiene Association, and the National Research Council. A member of the division represented The Surgeon General on the Interdepartmental Committee on Venereal Disease Control. Colonel Turner, who had been assigned on 29 January 1942 to the Preventive Medicine Division, was designated to head the expanding Venereal Disease Control Subdivision and to develop the new Army venereal disease control program as expeditiously as possible. The Venereal Disease Control Division, as it was reorganized in March 1942, was able also to place into effect and supervise a new venereal disease control program which was to be carried out throughout the Army.

By mid-1942, the essential work of the division was being carried out by three Medical Corps officers, one Sanitary Corps officer, and three clerk-stenographers. (In 1918 the analogous branch had included seven officers and four enlisted men.) The internal organization was dictated by functional considerations into three branches—Preventive Measures, Civilian Collaboration, and Education. Colonel Turner was in charge of the division and also the Preventive Measures Branch. As chief of the division, he was immediately responsible for the work of the entire division and represented The Surgeon General and the Army on various committees and boards dealing with the problem of venereal disease. His primary concern as the officer in charge of preventive measures was the collection and analysis of reliable data on the occurrence of venereal disease, the study of rates, the evaluation of different forms of prophylaxis, and the procurement and assignment of specially trained personnel. The 85 or more venereal disease control officers in the field at this time were personally selected by Colonel Turner. The statistician, 1st Lt. (later Capt.) Stanley B. Russell, MAC, was also assigned to the Preventive Measures Branch. He assisted the chief of the branch and was personally responsible for the processing of syphilis registers, the analysis of raw data on venereal disease, and the carrying out of routine office procedures of the division. Maj. (later Col.) William A. Brumfield, Jr., MC, was in charge of the Civilian Collaboration Branch and, as the title of the branch suggests, maintained liaison with and assisted the division chief in coordinating the activities of various national, State, local, and private organizations which were participating in the effort to reduce sources of infection within the civil population. Additionally, he maintained liaison with the Navy Department. The officer in charge of the Education Branch was Maj. (later Lt. Col.) Gaylord W. Anderson, MC. His functions primarily concerned the study and development of various methods relating to the education of the soldier in venereal disease prevention and the preparation of material for this program. In many respects, these functions were on the

order of a widespread advertising and selling campaign rather than strictly educational.

Later developments and changes.—Colonel Turner became director of the Civil Public Health Division of the Preventive Medicine Service on 1 January 1944 and was replaced as the director of the Venereal Disease Control Division by Major Sternberg. In November 1942, the Preventive Medicine Division, Professional Services, was given responsibility for the treatment of venereal disease (p. 147) and the Treatment Section was formed, replacing the Preventive Measures Branch. On 19 September 1944, the Civilian Collaboration Branch was eliminated and its duties were assigned to the director of the Venereal Disease Control Division. At the same time, the Preventive Measures Branch was reinstituted and the Education Branch discontinued. When, on 6 January 1944, Capt. (later Maj.) Granville W. Larimore, MC, then chief of the defunct Education Branch, was made chief of the Health Education Unit, Preventive Medicine Service, the educational functions of the Venereal Disease Control Division were transferred to the Health Education Unit.

Consultant functions of staff.—One of the most important functions of the Venereal Disease Control Division staff during the war was that of consultant to various field installations and oversea theaters. Staff members made frequent field trips in the Zone of Interior and overseas for the purposes of analyzing problems encountered at the various installations and of observing firsthand the venereal disease program in operation. This was particularly important in determining defects in the program and needs for changes or improvements. It also served to cement personal relationships with the men in the field—relations which proved to be of considerable value. In addition, special problems encountered in various theaters overseas were of sufficient importance that requests were sent to the Office of the Surgeon General for assistance from the Venereal Disease Division staff. A number of oversea trips were made in this connection including trips to Africa, the Middle East, India, the South Atlantic Command, and the Pacific.

Venereal disease control for WAAC.—In response to a strong recommendation by a committee of the National Research Council pertaining to a provision for venereal disease control among female components of the Army, approval was granted in early May 1943 for the establishment of a WAAC (Women's Army Auxiliary Corps) Liaison Section in the Venereal Disease Control Branch. On 28 May 1943, Maj. (later Lt. Col.) Margaret D. Craighill, MC, was assigned to the branch as chief of the WAAC Liaison Section. Since Major Craighill's responsibilities with respect to medical problems of the WAAC soon came to extend beyond the field of venereal disease, which never in fact constituted a serious problem among this group of service personnel, she was transferred on 15 July 1943 to the Operations Service, Office of the Surgeon General, and the WAAC Liaison Section was discontinued.

ORGANIZATION AND PROGRAMS IN THE FIELD

Establishment of control officers.—Shortly after the outbreak of war, the chief and various subdivisions of the Preventive Medicine Division drew up plans for a reorientation of activities toward lines specifically designed to meet the needs of war. In his 29 December 1941 memorandum to Colonel Simmons, Captain Gordon included the following recommendations with respect to the control of venereal disease: "It is believed that the plan proposed by you of establishing a venereal disease control officer in the GHQ of any expeditionary force, the Staff of the Surgeon of each Army, Division, Corps Area (and Department), and each camp of 20,000 or more is fundamental to the success of the venereal disease control effort. This, along with the equally important and concurrent problems of finding the best qualified individual for each position and insuring that their services be used to the fullest possible advantage, represents in my opinion the greatest contribution that the office can make to the control efforts."

The proposed plan to establish venereal disease control officers in various commands had been submitted to The Surgeon General by Colonel Simmons earlier in December 1941. Both the Training and Personnel Divisions of the Office of the Surgeon General had approved the plan, and it was submitted essentially unchanged by The Surgeon General to The Adjutant General on 5 January 1942. In giving the background of the situation, The Surgeon General wrote:

> The recent declaration of war has made it necessary to reconsider the Army's program for the control of venereal diseases in order to make such changes as may be required to augment and strengthen this program. The control measures employed during recent years have produced a very satisfactory decline in the disease rates and have been adequate for the peacetime conditions which existed; however, the change to a wartime status introduces many new conditions requiring additional facilities for the effective control of these diseases. For example, there will be an increase in the hazard of infection due to the development of a greater reservoir of infected civilians in contact with the expanding Army. Also the increased responsibilities and duties of the surgeons and medical inspectors of large organizations and units will further limit the time available for the important duties required in connection with the prevention of venereal diseases.
>
> Anticipating this situation, tentative plans were considered several months ago with a view to augmenting the medical staffs of such organizations by the assignment to them of additional medical officers who are specially trained in control of venereal diseases. Such an arrangement has been actually tried in one location, namely, at Fort Bragg, North Carolina, where Major Paul Padget, a reserve officer from The Johns Hopkins Medical School with special training in venereal disease control, was placed in charge of all diagnosis, treatment, and control activities. This arrangement has worked out in a most satisfactory manner and has resulted in a definite improvement in the venereal disease control program at Fort Bragg.

The Surgeon General then went on to inform The Adjutant General of a list of qualified civilian physicians which his office had compiled to facilitate the selection and procurement of the required number of officers. Stressing the

urgency of the situation because of the time it would take to commission these physicians, he continued:

According to the plan a "venereal disease control officer" should be assigned as an additional member of the staff of the surgeon of each of the following organizations: (a) Headquarters, each corps area and department; (b) Headquarters, each camp of 20,000 or more troops; (c) General Headquarters; (d) Headquarters, Communication Zone; (e) Headquarters, each field army; (f) Headquarters, each division.

The "venereal disease control officer," as assistant to the surgeon, should be utilized to supervise and coordinate the entire program of venereal disease control. This includes the planning, initiation, and coordination of pertinent and timely measures to bring about a satisfactory reduction in venereal disease in troops.

In addition, The Surgeon General specified the duties which these venereal disease control officers would perform.

The plan was approved by The Adjutant General and promulgated in a command letter to the Army in February 1942.[8] Specifically, The Adjutant General authorized the assignment of a venereal disease control officer as assistant to the surgeon of each division, army, communications zone, general headquarters, corps area, department, and station complement serving 20,000 or more troops. General functions of these new venereal disease control officers were also mentioned, but, as for specific details, the letter stated: "From time to time The Surgeon General will publish such additional instructions as may be necessary for the guidance of venereal disease control officers." With the publication of this letter, the position of venereal disease control officer was first established in the Army during World War II. It was a singular landmark in venereal disease control activities.

To effect the provisions of the letter of 6 February authorizing the assignment of venereal disease control officers to posts and command headquarters, medical officers with training or experience in venereal disease control and public health were selected, and many civilian physicians with venereal disease control experience were invited to accept commissions and assignments to key positions. In addition, arrangements were made for the training of medical officers at the Johns Hopkins School of Hygiene and Public Health under the direction of Dr. Moore. Plans were made for the training of 100 officers for a period of 8 weeks and a refresher course of 2 weeks for certain officers already assigned to venereal disease control duties. On 21 February 1942, in a letter to surgeons of major headquarters, The Surgeon General stated (1) that selection of venereal disease control officers should be on the basis of established proficiency in this field and (2) that formal training in epidemiology and public health in recognized schools and experience in conducting a venereal disease control program in a city, county, State, or national public health agency were considered basic requirements.

---

[8] Letter, The Adjutant General to Commanding Generals, all Armies, Corps Areas, Departments, Divisions, and Communication Zones; Commanding General, Field Forces; Chief, Army Air Forces; Chief, Armored Force, 6 Feb. 1942, subject: Venereal Disease Control Officers.

Requests from the field for venereal disease control officers exceeded their availability, and therefore, through more informal procedures, additional medical officers were assigned to selected installations for venereal disease control training. It soon became evident that sufficient medical officers trained in venereal disease could not be recruited to enable the assignment of a venereal disease control officer to each division. This provision was accordingly rescinded, by War Department Memorandum No. W40–6–42, dated 10 September 1942, and the duties were assigned to the division medical inspector.

Duties and functions of control officers.—The functions and duties of a venereal disease control officer were specified in a previously cited letter from The Surgeon General to surgeons of major headquarters. These functions involved the prevention of venereal disease through a comprehensive educational program; adequate prophylaxis facilities—individual and dispensary; cooperation with civilian agencies in the elimination of civilian sources of infection; early detection, segregation, and adequate treatment of cases to break the chain of contact; the collection and the detailed analysis of data concerning the incidence of syphilis, gonorrhea, and other venereal diseases acquired by men in the units of the command; and continuous study of problems peculiar to the command with a view to recommending new measures. The venereal disease control officer was also instructed to reduce time lost per case through improvement of treatment methods.

Redefinition of control program.—Toward the close of 1942, The Surgeon General considered it advisable to publish a directive redefining the functions of the venereal disease control officer and the basic measures of the venereal disease control program. On 14 November 1942, a memorandum was therefore transmitted to The Adjutant General recommending the publication of a War Department circular summarizing the different phases of the program. Only a portion of this memorandum was finally published in War Department Circular No. 53 on 17 February 1943. Nevertheless, this circular was significant in many ways. For the first time, the service command venereal disease control officer was clearly designated as the officer chiefly responsible for the integration of the civilian and Army programs. The responsibility for the provision of inspectorial and consultant services to staging areas, ports of embarkation, and exempted stations—activities not otherwise provided with such a service heretofore—was also delegated to the service command venereal disease control officer. The Army Air Forces had developed a relatively autonomous venereal disease control program which had frequently led to duplication of effort.[9] This directive was designed to eliminate partially the conflicting and overlapping duties of venereal disease control officers assigned to service commands and those assigned to Air Force commands and stations.

---

[9] Personal observations of Maj. Ernest B. Howard, MC, Headquarters, 4th Service Command, 18 May 1942–19 April 1944.

Dual functions of control officers.—In many posts with a strength of over 20,000, where a full-time control officer was authorized, the post surgeon appointed the same individual as medical inspector and venereal disease control officer. To prevent this practice, The Surgeon General [10] recommended that the combining of the positions of medical inspector and venereal disease control officer should be discontinued. As the need, however, for medical inspectors became more acute, the practice of assigning the venereal disease control officer to other duties—usually medical inspector or chief of the venereal treatment section—spread, and by 1944 few full-time venereal disease control officers were assigned to posts.

Problems at ports of embarkation.—Early in the war when large numbers of troops were being shipped to the European theater, numerous protests were sent to the War Department from the command in the European theater with respect to the large number of troops arriving at the theater's port of debarkation with venereal disease. Major Sternberg went to the New York port of embarkation and to the numerous installations and camps used for staging areas to make a study of this problem. He discovered that soldiers to be shipped overseas were given 24- to 48-hour furloughs a day or two prior to their actual shipment. Many of these soldiers spent that time in one of the large cities on the eastern seaboard and in many instances were exposed to venereal disease. The ports of embarkation were doing careful inspections just before shipment, and soldiers found to have venereal disease at that time were held for treatment. However, since the incubation period in most of the venereal disease is from 3 to 21 days, many of the soldiers developed their venereal disease on shipboard or after arrival at the port of debarkation. The only solution to this problem would have been to give the final leave 2 or 3 weeks before shipment, but this was not considered fair or feasible. Nevertheless, the ports of embarkation were requested to carry out intensive venereal disease educational programs in an effort to reduce to a minimum the number of exposures and infections. At the end of the war, when troops were returning to this country from oversea theaters, this same situation occurred in reverse.

COLLABORATION WITH CIVILIAN AGENCIES

U.S. Public Health Service

Early cooperative efforts.—On 16 January 1940, The Surgeon General suggested to The Adjutant General that the U.S. Public Health Service be requested to cooperate with the Army in safeguarding the health of military personnel by suitable measures of extramilitary area sanitation in connection with the concentration of maneuvering troops in the Southern United States. He noted that such cooperation would be directed particularly to

[10] Letter, The Surgeon General to Commanding Generals each Service Command, Department, and Port of Embarkation, 2 Oct. 1942, subject: Venereal Disease Control Officers.

the control of venereal disease, but that other problems of environmental sanitation requiring liaison between the Army and civilian agencies would also be considered. On 30 January 1940, the Secretary of War wrote to Mr. Paul V. McNutt, Federal Security Administrator, requesting such assistance. The Secretary reflected on the fine support that had been given to the Army by the U.S. Public Health Service during World War I and continued:

> It is desired that the U.S. Public Health Service, operating under the authority of existing laws and using its own resources, cooperate with the Army in safeguarding the health of military personnel by suitable measures of extra-military area sanitation in connection with the present concentration of troops in the South. This cooperation is particularly desired at this time in regard to the increase in venereal disease which has been traced directly to organized vice in adjacent municipalities. Other matters of environmental sanitation will arise during the course of the coming maneuvers in which the U.S. Public Health Service can be of great assistance to the Army.
>
> I would appreciate hearing from you as to the extent and character of assistance the U.S. Public Health Service will be prepared to give the Army.

On 12 February 1940, the Federal Security Administrator replied to the Secretary of War indicating that the cooperation and assistance requested would be "extended gladly." He suggested that representatives of the two agencies confer with a view to determining the exact needs and the extent of the assistance required. On 23 February 1940, The Adjutant General directed The Surgeon General to arrange with the Surgeon General, U.S. Public Health Service, for a conference of representatives of the two agencies to plan for joint action. Such a conference involving Army and U.S. Public Health Service representatives was held, and on 18 March 1940, a letter was sent to the Commanding General, Eighth Corps Area, Fort Sam Houston, Tex., informing him of the consent of the Public Health Service to cooperate with the Army in safeguarding the health of military personnel and directing him to furnish the fullest possible assistance to the Public Health Service representatives.

On 5 April 1940, Dr. Raymond A. Vonderlehr, Assistant Surgeon General, Division of Venereal Diseases, U.S. Public Health Service, wrote to Col. (later Brig. Gen.) Albert G. Love, MC, in the Office of the Surgeon General with reference to the forthcoming May 1940 Conference of State and Territorial Health Officers at which plans were to be formulated for the provision of U.S. Public Health Service aid throughout the country for the fiscal year beginning 1 July 1940. In this letter, Dr. Vonderlehr suggested that it might be desirable for the Army to obtain commitments from State and local health departments with reference to the development of better health services in the civilian areas under consideration for future troop concentrations and maneuvers.

Meanwhile, the U.S. Public Health Service sent its representatives into the Louisiana maneuver area in accordance with the request of the Secretary of War. The work accomplished by these representatives was so satisfactory

that, on 11 April 1940, The Surgeon General recommended to The Adjutant General that the arrangements made in the Louisiana maneuver area be extended to all other maneuver areas and that similar arrangements be established for extracantonment sanitation at all regular Army posts throughout the country. This request was favorably considered by the War Department, and on 29 April 1940 Dr. Parran was notified that The Surgeon General was authorized to make arrangements with the Public Health Service for further cooperation in extracantonment sanitation, provided the measure met with the approval of the Public Health Service. It was further suggested that detailed arrangements be made at informal conferences as was done in the Third Army maneuver area. To effect this extended collaborative program, The Adjutant General sent letters to the commanding generals of the First, Second, Third, and Fourth Armies and to the commanding general of each corps area, informing them of the proposed project and outlining the general plan agreed upon by the Public Health Service and the War Department.

On 20 May 1940, Dr. Vonderlehr wrote to The Surgeon General making certain recommendations which portended the establishment of the extensive contact-reporting program. In this letter, he stated: "Since the incubation period for syphilis is so long that relatively few cases acquired in the Louisiana-Texas area will develop during the maneuvers, it is apparent that the reporting of contacts suspected of being infected in Louisiana and Texas will do much to discover such contacts and bring them under treatment and control before the second maneuvers are held in this area in August. I feel sure that the State and local health authorities will be glad to cooperate on this basis if you are able to furnish the necessary information."

On 22 May 1940, The Surgeon General recommended that The Adjutant General direct corps area commanders to report to the State boards of health of Louisiana and Texas the source of infection of venereal diseases developing among soldiers after the return of their organizations from the maneuver areas. On 31 May 1940,[11] a letter was published incorporating these recommendations, and the contact-reporting program had its inception.

Liaison officers assigned to all corps areas.—The early improvised relationship between the U.S. Public Health Service and the Army was formalized in May 1940 by the adoption at the Conference of State and Territorial Health Officers of the Eight-Point Agreement (appendix B). In order to facilitate the operation of this agreement and to provide close liaison in all matters pertaining to public health, an agreement was reached by the Army and the U.S. Public Health Service to detail a Public Health Service officer to each corps area headquarters. On 28 October 1940, the corps area commanders were informed by The Adjutant General of these assignments and were directed to provide suitable office space and equipment and to cooperate

[11] Letter, The Adjutant General to Commanding Generals of all Corps Areas, 31 May 1940, subject: Extension of Present Utilization of U.S. Public Health Service.

with the U.S. Public Health Service and its representatives to the fullest extent.

Attacks on Army venereal disease policies.—This well-established working relationship was temporarily shaken by publication in 1941 of a book by Dr. Parran and Dr. Vonderlehr entitled "Plain Words About Venereal Disease." This book criticized the Army for what the authors considered its failure to take sufficiently drastic action against prostitution in extracantonment areas. Charges and countercharges were made, and eventually, on 27 November 1941, Mr. McNutt wrote to the President about the matter. Shortly afterwards, however, the attack on Pearl Harbor occurred. With the American declaration of war, what had threatened to precipitate a serious break in mutual confidence between the Army and the U.S. Public Health Service faded into insignificance in the face of the new responsibilities and problems facing both services.

Summary of U.S. Public Health Service-Army collaboration.—With the exception of this temporary schism, the relationship between the U.S. Public Health Service and the Army from 1940 to 1945 was highly satisfactory and mutually advantageous. To a varying extent, every activity of the Venereal Disease Control Division of the Public Health Service during World War II affected the Army's program. Only the history of that division's activities (in the files of the U.S. Public Health Service) can tell the complete story of that collaboration and assistance. The success of the Army venereal disease control program in the Zone of Interior was due in no small measure to the active support and cooperation provided by the Public Health Service. The program of the Public Health Service constituted one of the most valuable contributions to venereal disease control during World War II. Important phases of this program were liaison activities at service command headquarters; cooperation in the contact and separation programs; support of State and local control programs by allocation of funds and assignment of personnel; distribution of educational literature, films, and posters; analysis of statistical data; support of legislation; establishment of rapid treatment centers; organization of public meetings; and extensive research activities (fig. 13). Some of these activities are discussed elsewhere in this chapter.

American Social Hygiene Association

The Venereal Disease Control Division of the Army and the American Social Hygiene Association maintained a close collaborative relationship in both World War I and World War II. As the only nongovernmental, private agency continuously active for many years in venereal disease control, the American Social Hygiene Association occupied a key position in civilian control efforts and through its educational, legal, and other activities provided invaluable support and assistance to the Army. The moving spirits of the American Social Hygiene Association, Dr. William F. Snow and

FIGURE 13.—U.S. Public Health Service bus clinic. A U.S. Public Health Service physician demonstrates how blood test specimens are taken in these mobile clinics operated primarily in the South. (Photo courtesy U.S. Public Health Service.)

Dr. Walter Clarke had cooperated with the U.S. Public Health Service, the Army, and the Navy in World War I and were therefore able to bring their experience to bear on the problems of World War II. From the standpoint of the Army, the major contributions of the American Social Hygiene Association during World War II included the organization of local social hygiene societies and their sponsorship of public meetings to stimulate citizen interest; the improvement of State antiprostitution laws; the investigation of prostitution activities by undercover methods and the submission of reports of these investigations to the Army and other interested agencies; and the provision of extensive educational material in the form of posters, pamphlets, and films for use in Army installations (fig. 14).

Role of the Association.—The role of the American Social Hygiene Association was formally recognized in Point Eight of the Eight-Point Agreement. As stated elsewhere (p. 140), the full text of the Eight-Point Agreement was published as a directive to the Army. On 16 December 1940, the attention of commanding generals of all armies, corps areas, and departments was again directed to the American Social Hygiene Association's activities by a War Department letter concerning control of the use of intoxi-

FIGURE 14.—Scene from the American Social Hygiene Association film "With These Weapons," produced for the war effort. (Photo courtesy of American Social Hygiene Association.)

cating beverages and the improvement of moral conditions near camps and stations. The American Social Hygiene Association maintained a central headquarters in New York City and assigned field representatives to each service command to provide liaison with service command headquarters. Thus, by the end of 1940, collaboration between the American Social Hygiene Association and the Army had been firmly established through the publication of directives and the assignment of American Social Hygiene Association field representatives (fig. 15).

Antiprostitution activity of the Association.—One of the most important activities of the American Social Hygiene Association was its undercover studies of prostitution in all the larger cities and towns. The association conducted recurring surveys of communities and reported its findings to different Army command levels for information or action. In numerous instances, prostitution activities were first detected by these surveys, and action was initiated resulting in their elimination. Without the incontrovertible evidence provided by these surveys, the effort to repress prostitution and enforce antiprostitution laws would have failed in many cities because of resistance and obstructionism by prostitution interests, the apathy of police and citizens, and the difficulty of proving in court the existence of prostitution.

FIGURE 15.—President of American Social Hygiene Association confers with the three Surgeons General. Dr. Ray Lyman Wilbur (center) discusses venereal disease control measures with (left to right) Comdr. C. L. Andrus, USN, representing the Surgeon General, U.S. Navy; Maj. Gen. James C. Magee, Surgeon General, U.S. Army; Dr. Thomas Parran, Surgeon General, U.S. Public Health Service; and Dr. William F. Snow, chairman of the Executive Committee, American Social Hygiene Association, Washington, November 1940.

The Army's venereal disease control program was also facilitated by widespread improvements in State and local antiprostitution laws that were brought about mainly through efforts of the legal section of the American Social Hygiene Association. Many States strengthened their existing laws, and others, with no previous legislation, passed "model" laws suggested by the American Social Hygiene Association. The association published an exhaustive study entitled "Digest of State and Federal Laws Dealing With Prostitutions and Other Sex Offenses," Publication A–422. One hundred copies of this study were distributed within the Army to venereal disease control officers. The association also supported the May Act in 1941 and several other bills involving venereal disease control.

Stimulation of interest by the Association.—Venereal disease control programs, like other public health efforts, to an important degree depend for their success upon the maintenance of a high level of professional and

lay interest. The American Social Hygiene Association significantly contributed to this phase of the educational program by conducting well-publicized (fig. 16) Social Hygiene Day meetings each year in cities throughout

FIGURE 16.—Social Hygiene Day, 2 February 1944. These and similar posters were distributed to and displayed in pharmacies throughout the country to publicize Social Hygiene Day and to get educational and informational material to the public. (Photo courtesy of American Social Hygiene Association.)

the country to which the Army, the Navy, and the U.S. Public Health Service, as well as local groups, were asked to send representatives (fig. 17). These meetings served to prevent inertia and apathy and often injected new enthusiasm into local control efforts.

Division of Social Protection

Development of the Division of Social Protection and its objectives.—Following adoption of the Eight-Point Agreement and the increasing evidence in early 1941 of commercialized prostitution in civilian communities surrounding Army installations, a new agency was established in the Office of The Coordinator of Health, Welfare, and Related Defense Activities, Office for Emergency Management, to implement Point Six of the Eight-Point Agreement which referred to the repression of commercialized and clandestine prostitution. This agency was the Division of Social Protection, formally established in early 1941. On 3 September 1941, the Division of

FIGURE 17.—Participants in Social Hygiene Day meeting in Boston, 1944. Left to right, Capt. Edward M. Cohart, MC, Venereal Disease Control Officer, First Service Command; Dr. C. Walker Clarke, American Social Hygiene Association; Lt. John L. Ward (MC), USNR, Venereal Disease Control Officer, 1st Naval District; and Dr. George Gilbert Smith, president of the Massachusetts Society for Social Hygiene. (Photo courtesy of American Social Hygiene Association.)

Social Protection was made a subdivision of the Division of Health and Welfare, Office of Defense Health and Welfare Services, Office for Emergency Management, and remained in that status until 29 April 1943. On the latter date, the functions of the Office of Defense Health and Welfare Services were transferred to the Federal Security Agency where the Office of Community War Services was established as an integral part of the Office of the Administrator. The Social Protection Division functioned within the Office of Community War Services until 30 June 1946.

The broad objectives of the Social Protection Division were the safeguarding of the Armed Forces and the civilian population from the hazards of prostitution, sex delinquency, and venereal diseases. To accomplish these objectives, the section was instructed to gather and evaluate information with respect to: Prostitution and related conditions in cities and counties adjacent to military establishments, the statutory and administrative meas-

ures designed to combat such conditions, the extent to which these measures were enforced, and the results being achieved. The section was also given the mission to implement community activities directed toward the protection of women from sexual exploitation and the social rehabilitation of prostitutes and other sexually delinquent women. By September 1941, the program of this division had begun to take shape, and regional and State representatives had been assigned to the field. On 2 October 1941, the War Department advised the field of the establishment of this new agency and outlined the program of the division.

National program of the Division.—The program by which the Social Protection Division attempted to achieve these broad objectives included the promulgation of policies in cooperation with such national law-enforcement societies as the International Association of Police Chiefs and the National Sheriff's Association, the preparation and distribution of educational material, the organization of coordinating committees (The Interdepartmental Committee on Venereal Disease Control and the National Advisory Venereal Disease Committee), the arranging of local public meetings, and the application in each local community of the policies and programs developed by these national deliberative committees. The field staff of the Social Protection Division, including 12 regional offices and their associated suboffices, had the responsibility of transmitting these policies to, and effecting their application in, local communities.

Field operations of the Division.—The translation into community action of policies and programs laid down from the Washington office of the Social Protection Division was the responsibility of field, regional, and State social protection representatives. Theirs was a complex and difficult operational assignment. It was necessary for them to coordinate their activities with the U.S. Public Health Service and the American Social Hygiene Association whose activities in the field of venereal disease control long antedated those of the Social Protection Division. In addition, they had to integrate their programs with that of the armed services whose venereal disease control officers also carried out control functions in the civilian communities surrounding Army installations. Furthermore, the already difficult functions of these field representatives was made more complex when the Social Protection Section was given the responsibility for the preparation of special reports in connection with the May Act. The conduct of investigations and the preparation of reports in conjunction with this added responsibility became largely an added function of these field representatives. It was not surprising that, in many instances, efforts of these diverse agencies conflicted instead of supporting one another.

Sometime after Mr. Eliot Ness became director of the Social Protection Division, a National Advisory Police Committee on Social Protection was organized as an advisory body to the division. This committee, made up of eminent police chiefs and sheriffs, made recommendations that were sent to

every police chief and sheriff in the country. The judiciary and the legal profession were brought into the program on a national level through the American Bar Association which appointed a National Committee on Courts and Wartime Social Protection to work with that division. This committee included many of the leading law experts in the country. It completed a study embracing recommendations for adequate health and prostitution laws which was submitted to the States and endorsed by the Council of State Governments. Mayors and city managers were reached from the national level by articles which appeared in the publications of the American Municipal Association, the National Conference of Mayors, and the Inter-National City Managers Association. The American Municipal Association made the social protection program one of the principal subjects of its annual meeting in 1942. To influence liquor vendors, the help of the American Brewing Foundation, the Distilled Spirits Institute, and State liquor control boards was enlisted.

The National Hotel Association in cooperation with the Social Protection Division set up standards for good hotel operations, and educational material incorporating these recommendations was distributed to hotels throughout the country. To counteract pimping by taxicab drivers, which had become flagrant in many communities, the Social Protection Division and the Office of Defense Transportation completed a joint agreement for the revocation of Certificates of War Necessity when voluntary cooperation could not be obtained. The National Cab Association embarked upon an educational program in which drivers' unions also participated. Activities directed toward the prevention of prostitution and the rehabilitation and redirection of prostitutes were also initiated in cooperation with committees appointed by various national social agencies such as the Conference of Women Superintendents. These and many other policymaking and coordinating activities of the Social Protection Division were energetically carried out by Mr. Ness, who, as director of public safety for Cleveland, Ohio, had already completed a successful antiprostitution and general law-enforcement program and had established working relations with many of the agencies with which he now so effectively strove to develop and promulgate overall law-enforcement policies. In these efforts, Mr. Ness repeatedly sought and received the support and advice of the Office of the Surgeon General. Most of the directives that were distributed by the Social Protection Division were coordinated with the Army before publication. Meetings arranged by the Social Protection Division almost invariably included an Army representative, and many conferences and committees convened in which both the Army and the Social Protection Division participated. Mr. Ness was succeeded, as director of the Division, in 1944 by Mr. Thomas Devine who continued the same close and cooperative relationship with the Army that had been established by Mr. Ness.

Evaluation of Division activities.—The contribution of the Social Protection Division to the venereal disease control program during World War II will long remain controversial because the methods of approach utilized by different agencies involved in the program during the war were often conflicting. There is no question that in many communities the Social Protection Division succeeded in bringing about suppression of prostitution and improvement of the overall venereal disease control program. There is also no question, however, that in many communities and in many instances the Social Protection Division field representative did not clearly understand his role in the overall program and, instead of securing coordination and improved control procedures, caused confusion and personal enmity. Many of these difficulties were due to the failure of the Division of Social Protection representative to perceive clearly the different responsibilities of the Division and the U.S. Public Health Service. In many instances, the Social Protection Division representative made public health recommendations to State and local health authorities which conflicted with previous recommendations by U.S. Public Health Service representatives. In other instances, the approach to Army officers was so belligerent that conflict and personal enmity resulted. By contrast, at the national level the Social Protection Division worked most successfully with the military services and other agencies involved in venereal disease control.

Interdepartmental Committee on Venereal Disease Control

Establishment and organization.—Publication of the book "Plain Words About Venereal Disease" by Parran and Vonderlehr was the impetus for the establishment of the Interdepartmental Committee on Venereal Disease Control. Soon after publication of the book, Mr. McNutt conferred with the Secretary of War, Henry L. Stimson, in order to establish closer liaison between the various departments on the matter of venereal disease control. Mr. McNutt wrote to Secretary Stimson on 6 December 1941 recommending specifically that the Secretary of War, the Secretary of the Navy, and the Federal Security Administrator "* * * join quite informally as a top committee to confer perhaps once a month * * * to consider condensed overall reports from our several competent advisors * * *."

On 26 December 1941, Mr. McNutt again wrote to the Secretary of War recommending a program of collaboration for the Secretary of War, the Secretary of Navy, and the Federal Security Administrator in connection with venereal disease control. This program included nine points, point eight of which recommended the establishment of a committee of six composed of two representatives each from the War Department, the Navy Department, and the Federal Security Agency. Mr. McNutt also recommended that this committee consider as advisers to be frequently consulted appropriate representatives of the Department of Justice and recognized private agencies. On 6 January 1942, the Secretary of War wrote to the

Federal Security Administrator stating that the War Department was in accord with the general principles outlined in the proposed program and would cooperate in every feasible manner in the control of venereal disease in communities adjacent to military reservations. Two representatives, one from the Office of the Surgeon General and the other from the General Staff, were designated as representatives of the War Department to serve on the proposed Interdepartmental Committee. Colonel Simmons, Director, Preventive Medicine Division, was appointed representative for The Surgeon General.

Meetings of the Committee.—The first meeting of the Interdepartmental Committee on Venereal Disease Control was held in the Office of the Surgeon General on 23 December 1941 in response to a verbal request of Mr. Charles P. Taft, Assistant Coordinator, Health, Welfare and Related Defense Activities, Office for Emergency Management. This initial meeting was attended by representatives of the Army, the Navy, the Federal Security Agency, and the U.S. Public Health Service. It was concerned primarily with the problem of venereal disease control in Panama and Cuba. The second meeting of the Interdepartmental Committee on Venereal Disease Control was held on Friday, 2 January 1942, in the Office of the Surgeon General. At this meeting, in addition to the Army, the Navy, and the Federal Security Agency, representatives were also present from the American Social Hygiene Association and the Panama Canal Health Department. The minutes of the second meeting recorded that discussion touching upon venereal disease control problems in many areas, including the Caribbean, resulted in no definitive action. Although liaison had now been established between the different national agencies concerned with venereal disease control, it was not yet clear at the conclusion of this second meeting of the Interdepartmental Committee exactly what its function or method of action should be.

On 22 January 1942, the third meeting of the Interdepartmental Committee was held in the Office of the Federal Security Administrator. The committee now included a representative from the Federal Bureau of Investigation. A brief summary of this meeting was prepared for the Army Chief of Staff.[12] The representative of the Social Protection Division reported that favorable results were being accomplished throughout the country by cooperative action between the Social Protection Division, military services, and local officials. In connection with the May Act, discussion brought out that considerable differences of opinion concerning its invocation were expressed by representatives of the Public Health Service and the American Social Hygiene Association on the one hand, and the military services and the Federal Security Agency on the other. It was the opinion of Dr. Parran of the U.S. Public Health Service and Dr. Snow of the American Social Hygiene Association that invocation of the May Act in

---

[12] Memorandum, Brig. Gen. J. H. Hilldring to Chief of Staff, 26 Jan. 1942, subject: Conference, Inter-Departmental Committee on Venereal Disease Control.

certain localities as test cases should be considered in order to impress the underworld. Representatives of the military services on the other hand opposed indiscriminate invoking of the act, holding that the bill should be invoked only when local services could not or would not satisfactorily handle the situation. The representative of the Federal Bureau of Investigation informed the committee that it would be necessary that the Bureau be given advance notice of approximately 14 weeks in order that competent personnel could be trained to administer the act.

On 7 February 1942, Colonel Turner, chief of the Subdivision of Venereal Disease, was appointed a member of the Interdepartmental Committee to replace Colonel Simmons. The committee met again on 18 March 1942. The major portion of the agenda concerned problems of venereal disease and prostitution in Puerto Rico. After consideration of a report from Mr. Taft, the committee drafted a resolution condemning the attempt of the Caribbean authorities to regulate prostitution and transmitted the resolution on 18 March to the department surgeon. On 2 June 1942, another meeting was held at which subjects of general interest were considered, but no important action was taken. The initial results of the invocation of the May Act in the Tennessee area were discussed and it was noted that, although a good deal of publicity had occurred locally, very little note was taken of the invocation in other parts of the country. At this meeting, the Social Protection Division representative suggested that, in order to achieve better cooperation from State and local police authorities, it might be advisable to call a meeting of representatives of police chiefs in Washington. This recommendation was approved and such a meeting was later convened.

On 26 August 1942, Major Brumfield, The Surgeon General's representative to the committee, wrote a memorandum to Colonel Turner, chief of the Venereal Disease Control Branch, in which he stated: "The programs for venereal disease control in areas adjacent to military establishments are suffering because of lack of understanding between the local representatives of the agencies concerned. The principal offenders are the field representatives of the Social Protection Section who apparently do not understand exactly where they fit into the picture." This conflict existed principally between the Social Protection Division representatives and those of the Public Health Service. In order to clarify the situation, Major Brumfield had discussed the objectives of the nationwide program with the Assistant Surgeon General, Venereal Disease Division, U.S. Public Health Service; the director of the Social Protection Section; the executive director of the American Social Hygiene Association; and the Surgeon General of the Navy. At their suggestion, he had prepared an outline of the duties and responsibilities of the various groups which he now submitted with the memorandum. In a letter to Mr. Taft on 8 September 1942, Major Brumfield suggested that the outline be submitted to the Interdepartmental Committee on Venereal Disease Control for consideration at its next meeting. At the 18

September 1942 meeting of the Interdepartmental Committee, this draft was favorably considered and the committee recommended its issue as soon as possible to all staff members of the agencies concerned so that each agency would be better informed of its functions in relation to the other agencies. On 12 October 1942, the statement entitled "Relationships of the Army, Navy, United States Public Health Service, Social Protection Section, and the American Social Hygiene Association in Venereal Disease Control" was submitted by Mr. Taft to The Surgeon General for his comment and indorsement. On 2 November 1942, The Surgeon General acknowledged receipt of this statement and concurred in its publication. It was officially released for publication on 15 January 1943 by the Office of Defense Health and Welfare Services, Office for Emergency Management.

At the meeting of 18 September 1942, several other subjects received considerable study. The Federal Bureau of Investigation representative reported on the progress of the May Act in the Camp Forrest area. He reported indications that an attempt would be made by local individuals to contest the constitutionality of the act, but that it was expected that this challenge would be successfully met. The question of the use of Civilian Conservation Corps camps as venereal disease hospitals was also discussed, and consideration was also given to the request submitted by the Anglo-American Caribbean Commission for the assignment of a U.S. Public Health Service officer to this area.

At the next meeting of the Interdepartmental Committee on 17 November 1942, the venereal disease problem in the Caribbean and the operation of the May Act continued to command the attention of the committee. As a result of the discussion at this meeting regarding the venereal disease problem in the Caribbean, the chief of the Venereal Disease Control Division, Office of the Surgeon General, took action to strengthen the Army venereal disease control program in this area by securing and assigning Maj. (later Col.) Daniel Bergsma, MC, an officer specially trained in venereal disease control, to that command.

General satisfaction was expressed in connection with the operation of the May Act. It was the opinion of those present that the operation of the act had been effective in the two areas in which it was invoked but that the mechanism of invoking the act through War Department Circular No. 170, 16 August 1941, was cumbersome. The changes effected as a result of this observation were discussed elsewhere (p. 174).

In late 1943, some members of the Interdepartmental Committee were apparently convinced that further meetings would not result in sufficiently useful action to warrant them. For example, Dr. Snow, Chairman, Executive Committee, American Social Hygiene Association, wrote to Colonel Turner on 3 December 1943 saying, "* * * it [the committee] ought to be more active and useful or else some other device should be tried for accomplishing the

559625v—61——13

fullest measure of cooperation and exchange of current views between governmental and voluntary agencies * * *."

During 1944, the committee was inactive. In 1945, a meeting was convened at the request of the Social Protection Division on 12 September. Particular attention was paid by the conferees to the rising Army venereal disease rates and to the question of continuing the May Act. The minutes of the Committee meeting of 30 November 1945 stated that when Commander Ferree, the Navy representative raised the question of the importance of continuing the Interdepartmental Committee, it was the unanimous opinion of all those present that the committee should not only be continued, but that it should be an active functioning organization. At this meeting, the functions and responsibilities of the committee were restated; Mr. Watson B. Miller, Federal Security Administrator, was elected to serve as chairman; and the committee continued to function during the immediate postwar period.

Miscellaneous Agencies

The high proportion of venereal diseases acquired by military personnel in bars and taverns led the War Department to enlist the cooperation of the Brewing Industry Foundation and other liquor industries (fig. 18). War Department Memorandum No. W850–35–43, dated 18 July 1943, referred to the desire of the Brewing Industry Foundation, New York, N.Y., to assist the Armed Forces in maintaining satisfactory conditions in and around retail beer establishments near military posts. The memorandum authorized commanding officers to solicit the assistance of this foundation. On 30 August 1943, War Department Memorandum No. W850–43–43 further defined the nature of the assistance available from the Allied Liquor Industries, Inc., New York, N.Y., the Distilled Spirits Institute, Inc., National Press Building, Washington, D.C., and the Conference of Alcoholic Beverage Industries, New York, N.Y.

Numerous other organizations were at one time or another cooperating with the Office of the Surgeon General in its venereal disease control program. Among these were church organizations, State and local health departments (fig. 19), officials of States and cities, Negro organizations, the National Federation of Women's Clubs, and other groups. In addition, the Venereal Disease Control Division carried on an extensive correspondence with civilian doctors, nurses, and nonprofessional people regarding problems of venereal disease treatment and control.

One of the chief activities of the Venereal Disease Control Division of the Office of the Surgeon General during World War II was the civilian collaboration program. Because of the fact that the venereal diseases, unlike most other communicable diseases, were acquired by military personnel from civilian sources outside military jurisdiction, it was necessary to depend upon civilian agencies to a much greater degree than was true in other

FIGURE 18.—Bars and taverns played a part in the spread of venereal disease. An investigator of the Chicago Health Department checks, with a Chicago bartender, information supplied in a contact report.

Medical Department programs. In this program of collaboration with the military services, the Social Protection Division of the Office for Emergency Management (later, of the Federal Security Agency), the U.S. Public Health Service, and the American Social Hygiene Association played the most important roles. By February 1943 it was possible to say: "* * * the past year was a period during which collaboration between military and civil authorities reached a highly effective level. Venereal disease control officers of the Army were in almost daily contact with officers of the United States Public Health Service, with State and local health department officials, and with representatives of other civilian agencies."[13] Without these joint efforts the success achieved during World War II in the control of venereal disease among military personnel would never have been possible.

[13] Turner, T. B.: The Suppression of Prostitution in Relation to Venereal Disease Control in the Army. Federal Probation 7 (2): 8–11, April–June 1943.

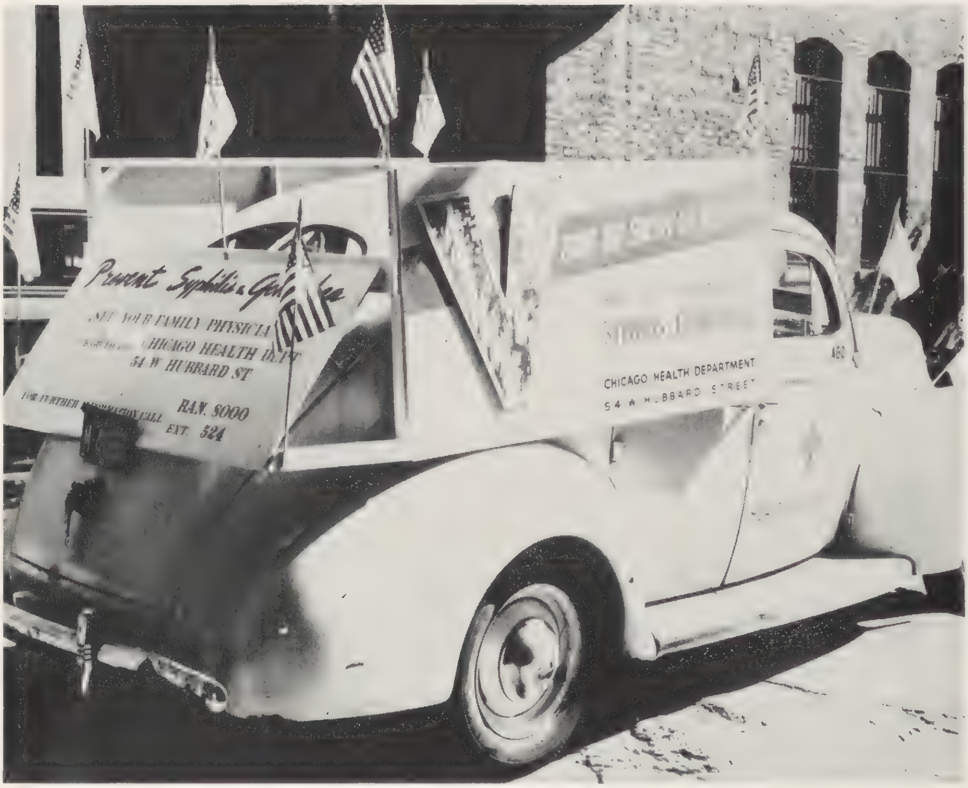


FIGURE 19.—Local health department efforts. The Chicago Health Department enters a float urging the fight against venereal disease in the annual Chicago Defender parade, 1943.

SPECIAL PROGRAMS AND ACTIVITIES

Control of Prostitution

Definitive action to eradicate commercialized prostitution was the responsibility of civilian law-enforcement agencies, but the degree to which these agencies carried out the provisions of the law depended very often upon the sincerity and persistence with which local commanding officers supported repressive measures. For this reason, the War Department issued a series of directives clearly stating its position with respect to prostitution and designed to impress upon line and medical officers the need for repression. The perennial struggle between those who advocated segregated areas of prostitution rather than suppression of prostitution as a venereal disease control measure was not eliminated by the many directives published by the War Department. In July 1943, it was still evident that at least a few commanding officers disagreed with the established policy of the War Depart-

ment. For this reason, another directive reiterating War Department policy was published in July 1943.[14]

Enlistment of support of State governors and industry.—To secure full support of the Army's control efforts, the Secretary of War, in March 1942, addressed letters to the governors of all States calling their attention to the danger which prostitution and venereal disease presented to the war effort unless prompt and effective suppressive measures were enforced. He asked the governors to assume responsibility for stimulating State and local law-enforcement agencies in carrying out the venereal disease control program and for the initiation of a program of public education. On 25 May 1942, the President sent a letter to Mr. McNutt commending the Interdepartmental Committee on Venereal Disease Control for its efforts and referring to the need for continued venereal disease control measures. This letter was transmitted by Mr. McNutt to some 8,500 key executives of war production plants. He called for their active encouragement of physical and moral fitness and referred specifically to the Eight-Point Agreement and to the need for the cooperation of these plants in repressing prostitution and controlling venereal disease locally.

Prostitution overseas.—The problem of prostitution in oversea theaters is discussed separately in the individual oversea theater reports. It is of interest to note at this point, however, that in 1945 evidence was becoming increasingly available that prostitution not only existed but in some oversea areas was being actively supported by U.S. Army commanding officers. On the basis of a report submitted by Dr. Joseph E. Moore, a letter from The Adjutant General to all oversea theaters was dispatched on 24 April 1945. This letter called the attention of commanding generals of oversea theaters to War Department policy with respect to the suppression of prostitution and strongly urged that measures effective in the continental United States also be applied in oversea commands. Use of off-limits authority when cooperation of civilian law-enforcement agencies could not be obtained was directed.

Results of antiprostitution program.—The results of the wartime antiprostitution program—a program which, it should be emphasized, was a joint enterprise entered into by many agencies of which the military services constituted only one—were evident in practically every city and community throughout the Nation. In over 600 cities and towns, segregated areas of prostitution activities were eliminated. In other communities, efforts to initiate new prostitution undertakings were frustrated by aroused and public spirited local citizens.

Evaluation of antiprostitution program.—Certain lessons were learned

---

[14] Letter, The Adjutant General to Commanding Generals, Army Ground Forces, Army Air Forces, Army Service Force; Commanding Generals, Defense Commands, Service Commands, Military District of Washington, Ports of Embarkation; Commanding Officers, Posts, Camps, and Stations, including exempted Stations, 31 July 1943, subject: Improvement of Moral Conditions in the Vicinity of Camps and Stations.

in the Army's wartime program that should be useful in any future repression program. It was early observed that the mere arresting of girls who were fined or even convicted of prostitution was inadequate to eliminate clandestine or commercialized prostitution. It was only when cities and communities emphasized the role of middlemen—facilitators, bellhops, cab drivers, and other individuals who procured customers for prostitutes—that any repression program could succeed. In addition, many communities which wished to cooperate with the Army and other agencies were handicapped by the lack of detention facilities. It was only after the provision in 1943 and 1944 of treatment centers and, in some instances, of enlarged jail facilities that these communities were able to conduct successful programs.

Operation of May Act

Procedures for invocation.—The May Act made prostitution in areas designated by the Secretaries of War and of the Navy a Federal offense. To establish a procedure for the invocation of the act, the War Department published on 16 August 1941 Circular No. 170 which described in detail the steps to be taken by each commanding officer before the actual invocation of the act by the Secretary of War. The Social Protection Division was intimately connected with the procedure for invoking the act, since each local commanding officer was required to submit a request to the regional representative of the Division for a special survey of the area to determine the extent of prostitution activities before invocation could be recommended. A report of this survey was transmitted to the commanding officer who then proceeded to take action in accordance with the recommendations made by the Division representative. Thus, the invocation of the act depended to an important extent upon the findings of the Social Protection Division. However, the Interdepartmental Committee on Venereal Disease Control found the procedures described in this circular to be exceedingly complicated due to the problem of conflicting jurisdictions. The committee favored centralizing the initiation of the act in a single general officer in each area in order to overcome this difficulty. Accepting these recommendations, The Surgeon General advised the War Department that the commanding general of each service command should be made responsible for initiating procedures and recommending to the War Department the invocation of the act. The change, as recommended, as effected by War Department Circular No. 12, 7 January 1943.

Invocation of May Act.—In only two areas was the May Act invoked during the war. The first occurred in an area surrounding Camp Forrest, Tenn., on 20 May 1942. For many months in the fall of 1941, Camp Forrest had attempted to secure adequate law enforcement in repressing prostitution in communities surrounding the camp. These efforts met with failure. After many conferences with State and local health departments, and with

their concurrence, the camp commander finally decided to request that the May Act be invoked (fig. 20).

FIGURE 20.—Opening of sports center at Camp Forrest. At about the same time the May Act was invoked in areas surrounding Camp Forrest, intensive efforts were made to provide adequate recreational activities on post, May 1942.

The second invocation of the act took place in and around Fort Bragg, N.C. Brig. Gen. E. P. Parker, Jr., Commanding General, Fort Bragg, had taken initial steps to secure repression of prostitution by local communities but, as in the case of Camp Forrest, had had no success. In October 1941, General Parker, through the Commanding General, Fourth Corps Area, requested the regional representative of the Social Protection Division to conduct the initial survey required by Circular No. 170. On the basis of the unfavorable findings reported by the Social Protection Division survey, General Parker requested Governor Broughton of North Carolina to convene a meeting of responsible health and law-enforcement officials to consider the contents of the report. This meeting was held, the findings were discussed, and the civil officials were given until 31 December 1941 to repress prostitution activities in the counties surrounding Fort Bragg. It

was apparent at the conclusion of this period that the efforts of the local authorities had failed, and further steps were therefore taken by the commanding general to invoke the May Act. Actual invocation of the act became effective at midnight on 31 July 1942.

In many other areas, initial steps were taken to invoke the May Act but actual invocation did not occur because local communities succeeded in eliminating prostitution without Federal intervention. By the end of 1942, it had become clear that a threat to invoke the act was almost as effective as invocation itself. Extreme foresight had been demonstrated as early as 1941 in the clear statement, in the program of the Social Protection Division, of this policy of depending upon local communities until every resource had been exhausted. This program stated in part:

> It is, therefore, the responsibility of this Division to attempt to bring about a voluntary adoption of its program [for the repression of prostitution] by local authorities as a permanent policy. The establishment by military authorities of areas as out of bounds for men in uniform, or the invocation of the May Act, are measures to be taken only as a last resort. Experience in the last war, and the attitude of the Federal and local authorities to date in this emergency, all point to the likelihood that our program can be established in most defense areas on a voluntary basis.

The May Act was never invoked again after its two early invocations in Tennessee and North Carolina, for it was not believed necessary by local commanding officers, the Social Protection Division, and other agencies involved. In almost every instance, local communities succeeded in solving their own problems without Federal intervention, although it was no doubt true that, without the existence of the May Act and the ever-present possibility of invocation, the same local communities might have been more reluctant to take positive action.

Effect of the Act.—In general, the May Act produced a definite decline in commercialized prostitution in the areas in which it was invoked. It was also apparent, however, that its enforcement met with difficulties in certain localities because of lack of local cooperation or the rigid requirements of the Federal court in defining the admissibility of evidence.[15] In eastern Tennessee and North Carolina, the act was particularly effective at the beginning of its enforcement. However, as commercialized prostitution activities were gradually suppressed and eliminated, "amateurs" and promiscuous girls became the primary factor in spreading venereal disease. When the Federal Bureau of Investigation was forced to direct its efforts against them, the operation of the act became less satisfactory and was subjected to certain criticism. An article entitled "In May Act Areas" by Kathryn Close, which appeared in the March 1943 issue of *Survey Mid-Monthly*,

---

[15] (1) Letter, Lt. Col. Roy C. Tatum to The Surgeon General, 1 Apr. 1943, subject: Report on Operation of the May Act, inclosure thereto. (2) Letter, Maj. Paul S. Parrino, Venereal Disease Control Officer, Camp Forrest, Tenn., to Capt. Myron T. Nailling, Assistant Chief, Litigation Section, Judge Advocate General Department, Headquarters, 4th Service Command, 14 Sept. 1943, subject: Enforcement of the May Act in Tennessee.

discussed many of the difficulties encountered by the Federal Bureau of Investigation in its efforts to enforce the May Act. In one area, the Nashville-Western Tennessee area, there was general dissatisfaction with the act both in the Army and among the Federal Bureau of Investigation agents who operated in this area. Soon after the act was invoked, a case was presented before the Federal court covering the Nashville area but was thrown out on the basis of the type of evidence presented. This initial court failure discredited the May Act in this area and made subsequent enforcement efforts more difficult. It was because of the unsatisfactory situation in Nashville that an inspector general's report[16] on the operation of the May Act in Tennessee contained the following conclusions:

1. Nashville has made less progress under the May Act than has been reported elsewhere where invoked, although some improvement in the general situation is noted (fig. 21).

FIGURE 21.—Soldiers' and Sailors' Room at Union Station, Nashville, Tenn. Well-meaning citizens of Nashville provided this facility which in its first year of operation entertained over 85,000 men.

[16] Report, Lt. Col. Warren D. Leary, Inspector General Department, to Commanding General, 4th Service Command, Atlanta, Ga., 30 Mar. 1943, subject: Special Inspection on Operation of the May Act—Vicinity of Camp Forrest, Tennessee.

559625°—61——14

2. The Federal Bureau of Investigation field division at Memphis was not able to put into effect the system of direct investigation and seizure employed by the Knoxville agency.

3. A vigorous enforcement of the new State legislation would make the May Act unnecessary.

4. The venereal rate at Camp Forrest has a more direct relationship with the education program in effect there by the venereal disease control officer than with the enforcement of the May Act.

Concerning the North Carolina area, the same inspector general recommended[17] that consideration be given to obtain more Federal Bureau of Investigation agents with May Act experience to work in the area; that consideration be given by Fort Bragg authorities to continue to exert pressure and stimulate city and county authorities and civic groups to be unrelenting in their efforts against prostitution; and that continued study be made by Fort Bragg authorities to determine the advisability of curfew regulations for Fort Bragg personnel and off-limits procedure for cab companies and other violators.

The opinion of The Surgeon General concerning the May Act was fully stated in the ninth endorsement to a letter pertaining to the operation of the May Act in counties surrounding Fort Bragg, which was initiated by the Judge Advocate General.[18] In this correspondence, The Surgeon General's opinions were, substantially, as follows:

1. The invocation of the May Act in the two areas mentioned has been followed by a substantial decrease in prostitution activities, and this has had a favorable effect on the venereal disease control program in those areas.

2. In general, the Federal Bureau of Investigation has done an effective job in providing leadership for enforcement activities in those areas. In the final analysis, the effectiveness of the May Act depends upon public opinion in the areas concerned, the cooperation of local law-enforcement officials, and the attitude and decisions of the Federal courts in those areas. The attitude of the various courts concerned in the two areas under discussion has by no means been uniform.

3. The threat of invocation of the May Act has had a salutary effect on law-enforcement activities by local officials in many areas in which the May Act has not been invoked.

In concluding his comments, The Surgeon General stated: "* * * this office is actively supporting a program designed to obtain effective law enforcement without resorting to invocation of the May Act. It is believed that much has been accomplished by such a program and invocation of the May Act in other areas is not recommended except in those communities which repeatedly fail to cooperate in this program."

---

[17] Report, Lt. Col. Warren D. Leary, Inspector General Department, to Commanding General, 4th Service Command, Atlanta, Ga., 23 June 1943, subject: Report of Special Survey of the Operation of the May Act about Fort Bragg, N.C.

[18] Memorandum, Judge Advocate General to Director, Control Division, Army Service Forces, 24 Sept. 1943, subject: Operation of May Act in Countries Surrounding Fort Bragg, North Carolina, 9th endorsement thereto.

This statement reflected a gradual change in policy that had been developing during 1942 and 1943 subsequent to invocation of the act in Tennessee and North Carolina. It coincided with the statement that had been enunciated by the Social Protection Division in 1941.

Contact-Tracing program

Development of reporting form.—The importance of securing adequate contact information from infected military personnel was recognized at the outset and was included in the Eight-Point Agreement (appendix B). Paragraph 6, AR 40–1080, 31 December 1934, had already required the reporting of communicable diseases to civilian health departments, but instructions for the routine transmittal of venereal disease contact information were not furnished until the publication of Circular Letter No. 50 on 28 May 1941.[19] Under the provisions of this circular letter, contact information was obtained by a medical officer and transmitted on a form provided for this purpose by the local State health departments. Although AR 40–1080 and the Eight-Point Agreement required the reporting of venereal disease information in accordance with local civil requirements or regulations, the actual transmittal of the form to State or local health departments was left to the discretion of the reporting medical officer, who weighed the usefulness and authenticity of the information. This system resulted in confusion because of the multiplicity of forms and channels of transmittal. On 11 May 1942, Dr. Vonderlehr, U.S. Public Health Service, wrote to Colonel Turner suggesting that a standard form be devised for reporting contacts to civil health authorities. Colonel Turner accepted the suggested and offered to collaborate with the Public Health Service in the preparation of such a form. A tentative form was devised and submitted to service command venereal disease control officers and Public Health Service liaison officers for their comments. A final form was developed by Major Brumfield and sent informally to each service command for local reproduction and distribution in late July 1942. Unfortunately, no uniform procedures for the transmittal of the form were directed. and, because of the informal distribution of the suggested form, many changes were made in the field.

In October 1942, the Venereal Disease Control Division recommended to the Executive Officer, Office of the Surgeon General, the adoption of a standard contact form for distribution throughout the Army, and by January 1943 the initial printing was under way. The distribution of this form (MD Form 140) established a uniform system of reporting contact information. In May 1945, minor revisions were made and the form was reprinted as WD AGO Form 8–148.

Operation of program.—The method of securing information from infected soldiers varied in the different commands. At some posts medical

[19] Circular Letter No. 50, Office of The Surgeon General, U.S. Army, 28 May 1941, subject: Cooperation With State Health Departments in Reporting of Venereal Disease.

officers assumed sole responsibility, while in others responsibility was delegated to enlisted men or to civilian public health nurses. Opinion differed as to the relative efficacy of the different methods, but it was clear that the more persuasive and persistent the questioning the more useful was the information obtained (fig. 22).

FIGURE 22.—Contact-tracing interview. Privacy, persuasiveness, persistence, and visual aids were of utmost importance in gaining useful information. (From TB MED 243. Photo courtesy of Bureau of Medicine and Surgery, Dept. of Navy.)

Evaluation of program.—The value of this contact-tracing program can hardly be overestimated. Thousands of infected girls were located and brought under treatment by civil health departments, and places of assignation were identified and eliminated by law-enforcement agencies (fig. 23). The nature of the epidemiological problem was clearly presented by analyses of the material made available through this program, and control efforts were concentrated and directed accordingly. These contact reports provided source data for papers appearing in the medical literature,[20] and the Social Protection Division charged with the responsibility of stimulating and coordinating local prostitution suppression programs, relied to a large extent

[20] (1) Norris, E. W., Doyle, A. F., and Iskrant, A. P.: Venereal Disease Epidemiology, Third Service Command: An Analysis of 4,641 Contact Reports. Am. J. Pub. Health 33: 1065–1072, September 1943. (2) Norris, E. W., Doyle, A. F., and Iskrant, A. P.: Venereal Disease Epidemiology in the Army Third Service Command: Progress Report for Period January Through June 1943. Ven. Dis. Inform. 24: 283–289, October 1943.

FIGURE 23.—Contact-tracing program results. Places of assignation were identified and thousands of infected girls were located and brought under treatment. (From TB MED 243. Photo courtesy of Bureau of Medicine and Surgery, Dept. of Navy.)

upon the contact information derived from these reports to develop and evaluate their local programs.

One fact that became particularly clear from a study of these reports was the interdependence of the control programs among all military establishments and civilian communities. As a result of greatly increased movement within the wartime civilian population, wide dispersion of contacts occurred. Each community provided infectious contacts for military personnel stationed in distant areas. It was early apparent that successful control programs influenced rates not only in posts contiguous to any given area but also in far distant installations. The effects of local failures were felt in distant commands.

In an article entitled "Epidemiology of Venereal Disease" published in the June 1946 issue of the *American Journal of Public Health*, Colonel Sternberg analyzed a collection of epidemiological information obtained from 71,156 Army personnel who had acquired venereal disease in the United States during the period from 1 January 1945 to 30 June 1945. A study of

these data revealed that, of all Army venereal infections which were diagnosed and treated in service commands, 32 percent occurred in service commands other than those in which exposure took place. During the period of this study, 9,641 venereal infections in Army personnel were diagnosed and treated in 1 of the 8 States comprising the Ninth Service Command. Of these, 4,540, or 47 percent, were acquired in 1 of the other 40 States. Colonel Sternberg pointed out that these data demonstrated most forcibly that no single State by its own efforts could hope to control venereal disease since a large percentage of the sources of venereal disease cases diagnosed in one State were traceable to another. He considered these facts ample justification for New York, Ohio, or any other State to have a legitimate interest in the effectiveness of the venereal disease control programs carried on by Illinois, Texas, California, or any other distant State and to be critical should these programs fail to meet acceptable standards.

Inducting Individuals With Venereal Disease

Development of program.—To facilitate the initial management of inductees with venereal disease, 34 barracks-type hospitals with a total of 6,510 beds were constructed at various reception centers and staffed by specially qualified medical officers. All these officers received a short intensive course in the diagnosis and treatment of venereal disease at the Institute for the Control of Syphilis, University of Pennsylvania, before their assignment. The first of these hospitals began to function in September 1942, and all were in operation by March 1943.

Operation and results of program.—Following induction, individuals with venereal disease were sent to the special hospitals where observation and treatment of high quality were accomplished without stigmatization. Patients were confined to the hospital area while under treatment but, for the most part, were ambulatory, were afforded regular recreation and exercise, and in addition were assigned light duties. Regular post exchange items such as cigarettes, candy, and toilet articles were available for purchase. The hospitals were neither marked nor inclosed in such a manner as to make them conspicuous or to identify their character. The average patient remained in the hospital for 10 days and was then referred through the reception center to a normal training assignment where further necessary treatment was administered by unit medical officers. Those with gonorrhea or chancroid were not discharged from the hospital until cured. All selectees with presumed latent syphilis were given a complete spinal fluid examination before induction and were rejected if any significant abnormalities were found.

Administrative problems encountered in the program, although complex, were overcome by a series of directives which appeared in early 1943. The function of the venereal disease facilities was outlined in detail in War Department Memorandum No. W40–1–43, dated 15 Jan. 1943. On the same

date, a letter was published [21] detailing the administrative and professional care of recent inductees with venereal disease. With the publication of this letter, problems involved in the induction of registrants with venereal disease were resolved, and the induction of such individuals proceeded at a rapidly increasing rate. Approximately 100,000 such registrants were processed during 1943. Because of the enormous backlog of inductable registrants with syphilis, further efforts were made late in 1943 to speed their induction. In August 1943, a letter [22] was published emphasizing the importance of the venereal disease induction program and authorizing the utilization whenever necessary of available Medical Department installations, other than venereal disease facilities at reception centers, for the processing of such individuals.

As a result of this program, 200,000 individuals with venereal disease were inducted through December 1945. Of these, approximately 170,000 were individuals with syphilis.[23]

Separation of Military Personnel With Venereal Disease

Development of program.—The importance of protecting the public from the spread of venereal disease by infected individuals discharged from the service was appreciated throughout the war. The basic Army regulations pertaining to the control of communicable diseases provided for the retention and treatment, before discharge, of individuals in an infectious state of venereal disease. AR 40–210, dated 15 Sept. 1942, also provided for the transmittal to the health department of the State of intended residence a summary of pertinent data, so as to enable civilian physicians to continue observation and treatment. It was apparent that the demobilization of the Army of World War II required a much more ambitious and detailed program than that envisioned in the Army regulations, and, accordingly, conferences with the U.S. Public Health Service were arranged to develop the plans for what later became a smoothly operating venereal disease separation program.

During January and February 1944, Colonel Sternberg met with Dr. John R. Heller of the U.S. Public Health Service to develop specific plans for the separation program. At these conferences, it was decided that the Army would draw blood for serologic tests for syphilis and transmit the blood specimen to a laboratory designated by the Public Health Service for examination, treat individuals with infectious venereal disease before discharge, and make syphilis registers available to the Public Health Service

[21] Letter, The Surgeon General to Commanding Generals, Army Ground Forces, Army Air Forces, Services of Supply, Service Commands, Departments; Commanding Officers, All Posts and Camps Having Reception Centers, 15 Jan. 1943, subject: Treatment of Recently Inducted Individuals With Venereal Disease.

[22] Letter, The Adjutant General to Commanding General, 1st Service Command, Army Service Forces, 5 Aug. 1943, subject: Acceptance of Men With Venereal Diseases.

[23] Karpinos, B. D.: Venereal Disease Among Inductees. Bull. U.S. Army M. Dept. No. 10, vol. VIII, October 1948.

for the abstracting of information. Syphilis cases were to receive 10 Mapharsen and 5 bismuth injections, and all other venereal disease cases were to be held until cured or until optimum treatment had been administered. The Public Health Service, on the other hand, agreed to examine the blood specimens through State and local serologic laboratories and insure the proper followup and necessary treatment of separatees with syphilis.

This program was recommended by Mr. McNutt, in a letter to Secretary Stimson on 19 February 1944. Secretary Stimson replied favorably on 28 February 1944. Dr. Parran also wrote to Secretary Stimson on 6 March 1944 and to Maj. Gen. Norman T. Kirk, The Surgeon General, on 9 March 1944. Dr. Parran expressed his hopes that the integrated approach, as planned, could be adopted.

The Secretary of War replied to Dr. Parran on 16 March 1944 as follows:

> The development of adequate plans for the management of individuals with venereal disease at the time of demobilization is of great interest to the Army. We are particularly anxious that procedures be effected at that time which will assure uninterrupted medical care for those individuals needing it and will prevent the return to civilian communities of soldiers with an infectious venereal disease. The preliminary plans to cope with this problem, as outlined in your letter, are considered most satisfactory, and you may be assured that the Army will exert every effort to carry out its share of the program.

Special problems.—The decision to undertake a mass blood testing survey of separatees was based upon the following considerations: The knowledge that a definite, but unknown, number of syphilitic infections had occurred among military personnel without detection and treatment; the desirability of providing a final serologic test for syphilis in order to determine the adequacy of the treatment given for the disease in the Army; and the importance of establishing seronegativity at separation in connection with veterans' pensions, et cetera. A program to provide treatment before discharge for individuals with positive blood tests but with no previous history of treatment was carefully considered. This program was not adopted for the following reasons:

1. A minimum period of 3 months was necessary to establish or exclude syphilitic infection.

2. Specialized diagnostic and treatment facilities with trained personnel would have to be organized.

3. The Public Health Service not only had its rapid treatment centers and State and local medical facilities adequate to handle the load but was anxious to assume the responsibility.

4. Separatees would resent delay of the separation process and would probably prefer treatment, when indicated, after separation.

5. The majority of individuals with a positive serologic test for syphilis at separation would have syphilis in a stage not likely to be communicable.

Revision of separation program.—The program developed by the Army-Public Health Service conferees and accepted by the Federal Security Ad-

ministrator and the Secretary of War was established experimentally at the Pilot Separation Center at Fort Dix, N.J., on 30 March 1944.[24]

During the next 2 months, several important changes were made in the program to remedy defects that had become evident at Fort Dix. A standard form, the "Army Separation Serology Report and Laboratory Slips" (WD AGO Form 38–1), was developed. The examination of the blood was carried out by the nearest Army laboratory rather than by State laboratories, thereby saving time, breakage, and expense. The syphilis register and the new serology report form were sent by the Army directly to the nearest regional U.S. Public Health Service unit. The regional units, in turn, prepared from Army serologic reports their own syphilis epidemiological report forms. For cases having a history of incomplete treatment, abstracts of Army syphilis registers were made on this form. The epidemiological information was then transmitted to State health departments by regional public health units, thus facilitating followup. These changes were established by distributing to separation centers a tentative outline of final physical examination regulations.

A further important revision of the venereal disease separation program was proposed in August 1945. The system of referring information from regional U.S. Public Health Service units to State health departments resulted in an inescapable delay between separation and initiation of followup treatment. To circumvent this difficulty, the Public Health Service proposed that its representatives be assigned to all separation centers to interview before discharge individuals with a positive or doubtful blood test. In September 1945, the Army accepted this proposal[25] and agreed to let the Public Health Service place its representatives in all separation centers and in many of the larger separation points. Separatees showing positive serologic tests were given the option of either being treated in a rapid treatment center before returning to their homes or being provided with transportation to a rapid treatment center of their choice. As for the other separatees with only doubtful test results or just a history of syphilis, copies of the Army serologic tests were forwarded to the Public Health Service regional units. In some cases of separatees not interviewed by the Public Health Service representative in the separation centers and points, the Army syphilis register was abstracted onto a single-sheet form, "Abstract of Army Syphilis Register" (VM 1296), and attached to serology reports. The data from these reports were then transcribed by the Public Health Service to their syphilis epidemiological reports. In August 1946, the Public Health Service withdrew its representatives, and the Army took over preparation of these syphilis epidemiological reports.

---

[24] Letter, The Surgeon General to Commanding General, 2d Service Command, 30 Mar. 1944, subject: Final Physical Examination To Be Performed at Separation Center.

[25] War Department Technical Manual 8–255, Terminal Physical Examination on Separation From Military Service, 10 Sept. 1945.

Analysis of program.—Whatever the procedures at separation, a separation epidemiological report was eventually prepared for each separatee with a positive or doubtful serologic test reaction or with a history of syphilis. Only those whose treatment or observation had been completed while they were in the Army were exempted. From these separation epidemiological reports and from followup studies made by the Public Health Service, tables 15 through 17 were prepared.

As may be seen from table 15, covering the period November 1944 through October 1946, the serologic tests for syphilis revealed that 6.5 per 1,000 Army persons separated during this period had a positive test for syphilis without previous history; 10.9 per 1,000 separatees had a positive or doubtful serologic reaction without previous history of syphilis; and 9.1 per 1,000 separatees had a positive or doubtful reaction with history of syphilis. In round numbers, about 145,000 soldiers—2 percent of all those separated during this period—had a positive or doubtful reaction to serologic tests. Of these 145,000, 79,000 had no previous history of syphilis insofar as Army records were concerned—47,000 with positive reactions and 32,000 with doubtful reactions.

TABLE 15.—*Results of serologic tests for syphilis of U.S. Army personnel at time of separation, November 1944 through October 1946*

[Rate expressed as number of serologic reactions per 1,000 separatees]

Type of serologic reaction	Number of reactions [1]	Rate [2]
Separatees without history of syphilis:		
Positive	47, 029	6. 5
Doubtful	31, 819	4. 4
Total	78, 848	10. 9
Separatees with history of syphilis:		
Positive or doubtful	65, 608	9. 1
Negative	94, 137	13. 1
Total	159, 745	22. 2
All separatees:		
Positive or doubtful	144, 456	20. 0
Negative	94, 137	13. 1
Grand total	238, 593	33. 1

[1] The number of serologic reactions and their distribution by type were obtained from data supplied by the U.S. Public Health Service on the basis of Separation Epidemiologic Reports (FSA-USPHS Form 9576-B).

[2] The rates were computed on the basis of the total number of Army personnel separated during this period (7,207,478 persons), based on monthly reports submitted to The Surgeon General (SGO Form 916, before June 1945, and WD AGO Form 8-196, after June 1945).

It would be misleading, however, to interpret these results of the serologic tests as prevalence of syphilis among separatees. Followup studies made by the Public Health Service on separatees of all services referred for treatment indicated that slightly over one-third were not infected—the tests were biologically false positive; about one-third needed no treatment; and one-third required treatment. The data are presented in table 16.[26]

TABLE 16.—*Results of followup examinations by the U.S. Public Health Service of Armed Forces separatees with positive or doubtful serologic reactions for syphilis* [1]

Findings	Number of separatees	Percent
Separatees without history of syphilis:		
No infection	41, 614	66. 4
Infection under treatment before investigation	4, 578	7. 3
Untreated infection	16, 427	26. 3
Total	62, 619	100. 0
Separatees with history of syphilis:		
No infection requiring treatment	36, 155	69. 3
Infection under treatment before investigation	6, 359	12. 2
Untreated infection	9, 666	18. 5
Total	52, 180	100. 0
Total examined:		
No infection	41, 614	36. 3
No infection requiring treatment	36, 155	31. 5
Infection under treatment before investigation	10, 937	9. 5
Untreated infection	26, 093	22. 7
Grand total	114, 799	100. 0

[1] Data based on tabulations prepared by the State and regional tabulating units of the U.S. Public Health Service The data relate to followup cases reported through December 1946, except for the State of Mississippi after December 1945 and the States of California, Florida, Kentucky, and Louisiana and the City of New York after June 1946.

Although the number of biologically false positive tests, when presented in this context, appears excessive, it is within the range of biologic false positive and laboratory errors. The U.S. Public Health Service estimated that 6.24 per 1,000 of serologic tests performed on all separatees of the Armed Forces were false positives. Other data available to the Public Health Service indicate that this figure ranges between 4 and 7 per 1,000 depending on the

[26] The data relate to only about 58 percent of total reported cases with positive or doubtful serologic reactions. For various reasons, final data were unavailable for the other 42 percent. Furthermore, data for some States and New York City did not cover the full period.

test used, the proficiency of the laboratory, and the prevalence of intercurrent infections. Insofar as the separatees were concerned, malaria was one of the more common causes of nonsyphilitic reactions to the serologic test. Since the proportion of separatees exposed to malaria was greater than the proportion of the general population of the United States, this probably tended to inflate the proportion of so-called false positives among the reactors screened out by the serologic test.

A diagnostic breakdown of the treated cases is shown in table 17. The majority of the cases, about 42 percent, were diagnosed as early latent syphilis, and syphilis of unknown stage, about 31 percent, was the next most prevalent.

TABLE 17.—*Distribution of followup cases of syphilis in Armed Forces separatees, brought to treatment, by diagnosis* [1]

Diagnosis	Total		Without history		With history	
	Number	Percent	Number	Percent	Number	Percent
Primary syphilis	864	3. 3	559	3. 4	305	3. 2
Secondary syphilis	1, 430	5. 5	1, 222	7. 4	208	2. 2
Early latent syphilis	10, 882	41. 8	7, 841	47. 7	3, 041	31. 5
Neurosyphilis	508	1. 9	341	2. 1	167	1. 7
Late syphilis (excluding neurosyphilis)	4, 526	17. 3	2, 414	14. 7	2, 112	21. 8
Unknown stage	7, 883	30. 2	4, 050	24. 7	3, 833	39. 6
Total	26, 093	100. 0	16, 427	100. 0	9, 666	100. 0

[1] Data based on tabulations prepared by the State and regional tabulating units of the U.S. Public Health Service. The data relate to followup cases reported through December 1946, except for the State of Mississippi after December 1945 and the States of California, Florida, Kentucky, and Louisiana and the City of New York after June 1946.

SPECIAL PROBLEMS OF CONTROL AMONG NEGRO TROOPS

The venereal disease rate of Negro soldiers was consistently 8 to 12 times higher than the rate among white soldiers. It became evident early in the course of the war that venereal disease control measures and educational methods directed mainly toward white troops had little effect upon Negro troops. Various expedients were tried or recommended in early 1943 with singular lack of success.

Conference on Control

In an effort to develop an effective program specifically directed toward the Negro, The Surgeon General convened a conference of key medical officers and representatives of civilian agencies in Washington, D.C., on 5 October 1943. Present at this meeting, in addition to white and Negro medical officers from key installations and commands, were representatives from the Venereal Disease Control Branch, Office of the Surgeon General; the Training Division,

Office of the Surgeon General; the Special Services Division, Army Service Forces; the Office of the Air Surgeon; the Office of the Secretary of War; the U.S. Public Health Service; the Social Protection Division, Office of Community War Services, Federal Security Agency; and the American Social Hygiene Association.

Observations

The following observations were made by the conferees with respect to the extent of the problem, underlying factors in the civilian and military population, and possible methods of attack:[27]

The problem.—The seriousness of the venereal disease problem among Negro troops is evident from the fact that the Negro venereal disease rate varies from 8 to 10 times the white rate and has steadily increased, reaching a maximum of 152 per 1,000 per annum in August 1943. This rate is so high that it may result in material interference with the full military utilization of Negro troops. The syphilis rate of 30 per 1,000 per annum during the past 6 months is a rate 15 times that for white troops. This is a particularly unfortunate situation in view of the time lost due to lengthy treatment required and the possibility of serious complications. This rate creates an estimated requirement of 750,000 hospital bed-days for the treatment of Negro venereal disease cases in 1943, thereby throwing a very considerable additional burden on the Medical Department. This represents an approximate total of 60,000 cases of venereal disease in Negro soldiers in 1943, 15,000 of which will be cases of syphilis (based on prevailing rates). Eventually, this will result in an inestimable financial burden upon the Government for the care and compensation of conditions arising from this vast number of venereal infections. (These data relate only to Negro troops stationed in the continental United States and, further, do not include those infections acquired before induction.)

Underlying factors involved.—It is generally recognized that the causes for high incidence of venereal disease among Negroes are basically socioeconomic. Because of the interdependence of the underlying factors affecting both the military and civilian population, both are given consideration.

Some of the factors which influence the venereal disease rate in the civilian population are the following: (1) Low educational level, as evidenced by degree of illiteracy among Negro selectees, and general lack of knowledge about health matters, (2) inadequate law enforcement in Negro communities with respect to the increasing prostitution conditions brought on by the war, and (3) lack of recognition of the seriousness of the problem, together with reluctance to face the facts.

Some of the factors directly influencing the high venereal disease rate

---

[27] Memorandum, Lt. Col. Thomas B. Turner, MC, for Director, Preventive Medicine Division, 13 Oct. 1943, subject: Report of Conference on Venereal Disease Control Problems Among Colored Troops, with inclosure thereto.

among Negro military personnel are: (1) The factors noted for the civilian population which contribute to a high degree of infection in troops who come in contact with them, (2) insufficient recreational facilities to offset adverse conditions often encountered by Negro soldiers in extracantonment communities, (3) a venereal disease education program generally inadequate to meet the specific needs of Negro soldiers, and (4) the presence of a defeatist attitude on the part of many commanding officers with respect to venereal disease prevention among Negro troops.

Methods of attack.—The control of venereal disease among white troops is effected through measures aimed at reducing the sex-exposure rate, increasing the use of prophylaxis, and minimizing the risk of infection from the adjacent civilian community. These same general principles are no less valid when applied to Negro personnel, but their application presents many problems in addition to those encountered with white troops. However, the venereal disease incidence among Negro soldiers can be reduced and rates more nearly approximating those of white personnel can be achieved. This is evidenced by the experience in certain posts and commands where venereal disease control programs have been developed embodying good recreational facilities, improved educational techniques, good prophylaxis facilities, proper command support, and effective extracantonment cooperation.

Among these commands is the Eastern Flying Training Command with 30 stations having Negro personnel, located for the most part in the Southeastern United States, which has reduced its Negro venereal disease rate from 220 to 65 over the past 15 months. One of the major factors reported as contributing to this reduction is the use of Negro noncommissioned venereal disease control officers, specially trained in a short course at Tuskegee Army Air Field, Ala. These men, upon their return from the course, were utilized in promoting especially adapted venereal disease education for Negro troops, and in other phases of the venereal disease control program. Another important factor was the exceptionally strong command support given to the program.

The important role that recreation plays in the overall venereal disease control picture arises from the need for wholesome activity to occupy off-duty time as a substitute for the often undesirable recreation offered by the Negro civilian community, frequently in an environment conducive to the spread of venereal disease. The other role of recreation is its contribution to the improvement and maintenance of morale.

It is recognized that effective venereal disease education of Negro personnel offers many more problems and difficulties of accomplishment than does that of white troops. Some of these problems have their basis in the extreme lack of correct health knowledge among Negro soldiers. An educational approach, based on the fullest possible utilization of Negro officers and noncommissioned officers, will be the most effective, because Negro commissioned and noncommissioned officer personnel can better understand the mores,

folkways, and race psychology of the Negro soldier than similar white personnel, and can thus be used more advantageously. Furthermore, extensive use should be made of those psychological appeals for the avoidance of venereal disease which have proved to be effective in certain commands. Among these are appeals to racial pride, competitive spirit, and patriotism. The present training aids used in conjunction with venereal disease education lack maximum value because they are aimed primarily at the white soldier.

With respect to the repression of prostitution, the prevalence of commercialized Negro prostitution activity around many Army camps is a prolific source of venereal disease at the present time. This Negro prostitution problem, which is a recent development, requires a concerted attack by military and civilian agencies.

Because of the exposure of the Negro soldier to a more highly infected civilian population, the provision of the most effective prophylactic measures is essential. Where easily accessible station prophylactic facilities have been made available, a beneficial effect on the venereal disease rate has been universally observed. Individual chemical and mechanical prophylactic kits have been found to be useful adjuncts but not as effective at the present time as station prophylaxis. This can be accounted for by the reluctance of the men to use mechanical prophylactic materials, and the complexity involved in the use of the present two-tube chemical kit. A newly developed prophylactic measure against gonorrhea and chancroid is the use of sulfathiazole by mouth, the effectiveness of which, when properly administered, has been demonstrated in many installations. It is believed that its effective administration would be enhanced by the noncommissioned venereal disease control officer program referred to above.

Recommendations

The Surgeon General's conference on special problems relating to the control of venereal disease among Negro troops made the following recommendations:

Recreation.—The Special Services Division should give particular attention to the provision of recreation facilities for Negro troops so that the adverse environmental influences affecting the Negro soldier may be counterbalanced. Recreational activities for small units should be intensified. Better coordination of Special Services activities with sudden changes in training or assignments, which adversely affect troop morale, is desired. More effective liaison between Special Services officers and venereal disease control officers at all levels is needed, and it is recommended that appropriate directives covering this point be published.

Specialized personnel.—Negro medical officers with the proper qualifications should be selected to act as venereal disease control officers for Negro troops. The primary duty of these officers will be to develop and coordinate

venereal disease control activities among Negro troops of the command. A school for the training of Negro noncommissioned venereal disease control officers should be established at Tuskegee Army Air Field, Alabama, and the use of graduates should be similar to that in the Eastern Flying Training Command.

Education.—Training aids specifically directed at Negro troops are urgently needed and should be developed by the Training Division of the Surgeon General's Office in cooperation with the Venereal Disease Control Branch.

Repression of prostitution.—A suitable directive should be published reiterating the Army policy with respect to the suppression of prostitution and the use of off-limits action. The directive should remind unit commanders that this policy refers not only to white but also to Negro prostitution activities. The Army should give its fullest support to those civilian agencies engaged in a Negro prostitution-suppression program.

Prophylaxis.—Station prophylactic facilities, both on and off the post, for Negro personnel should be generally improved with respect to more suitable locations, better appearance, and the use of Negro attendants wherever feasible. Prophylactic stations for Negro troops should not be located in proximity to police stations or military police stations. Furthermore, efforts should be intensified to develop a single-tube chemical prophylactic kit effective against both syphilis and gonorrhea to replace the present two-tube kit which has been found to be too complex for maximum use.

War Department Circular on Control

One concrete result of the conference was the preparation and publication of War Department Circular No. 88, Venereal Disease Control Among Negro Troops, dated 28 February 1944, embodying in principle the recommendations made. This circular prescribed a complete program including assignment of Negro medical officers trained in venereal disease control techniques, improvement of recreational facilities, repression of commercialized prostitution, and provision of adequate prophylactic facilities.

During the 6 months following publication of this circular, the Negro venereal disease rate reached a high of nearly 160 per 1,000 men per year, and it was apparent that the circular had failed to achieve its purpose. Failure was attributed to the scarcity of trained Negro medical officers capable of carrying out this work, the wide dispersal of Negro troops, and in some instances a lack of satisfactory command interest or support. A notable exception to the overall failure of the program, a marked reduction in rate, effected at Tuskegee and Fort Huachuca, Ariz. (fig. 24),[28] demonstrated that successful venereal disease control programs in Negro troops were possible on a local level. The programs at these two posts were organized and carried out by

[28] Maj. (later Lt. Col.) George McDonald, MC, was outstanding in his work—T. H. S.

FIGURE 24.—WAAC personnel arrive at Fort Huachuca, Ariz. The arrival of Negro WAAC personnel at Fort Huachuca provided opportunities for wholesome on-post recreational activities for the Negro men stationed there, December 1942.

superior Negro medical officers, backed by strong command support and utilizing all available control procedures including educational media, religious appeals, competitions, and the development of venereal disease control officers among noncommissioned officers.[29]

Other Control Efforts

Concurrently with the Army's efforts to control venereal disease among Negro troops, civilian agencies were conducting campaigns directed toward the elimination of adverse influences in Negro communities (fig. 25). As a part of this campaign, the American Social Hygiene Association held a conference in New York City on 22 and 23 November 1943 on wartime problems in venereal disease control. One of the purposes of the conference was to consider practical measures whereby Negro voluntary organizations could best join in united action at Federal, State, and local levels to reduce the

[29] Memorandum, Lt. Col. Thomas H. Sternberg for Truman K. Gibson, Jr., Civilian Aide for Negro Affairs to The Secretary of War, 29 Sept. 1944, subject: Venereal Disease Control in Negro Troops.

FIGURE 25.—Learning the facts of venereal disease. This group of predominantly Negro patients at a rapid treatment center receive instruction through films, filmstrips, and lectures as a part of their rehabilitation.

venereal disease among the Negro population. Plans were developed for the initiation of an intensive venereal disease information program to be continued on a sustained, consistent basis for an indefinite period. A continuing action committee functioning under the American Social Hygiene Association was appointed. The committee included a representative from the Army.

In January 1944, the Military Training Division, Army Service Forces, decided to introduce a course on the leadership of Negro troops in all officer candidate schools and requested that a section on venereal disease be submitted for inclusion in this course. On 28 January 1944, this material was submitted and became part of the basic course of instruction at officer candidate schools.

After a preliminary conference with the Assistant Chief of Staff, War Department, G–1 (personnel and administration), and the Office of the Secretary of War concerning the material to be included in a motion picture designed to be viewed by Negro troops, the Venereal Disease Control Division and the Signal Corps cooperated in the preparation of the film, "Easy to Get." This was considered one of the best training films of the war.

In late September 1944, the Director, Venereal Disease Control Division, in an effort to establish a more effective approach to the problem of venereal disease among Negro troops—a problem which was no nearer solution in 1944 than in 1942—joined Mr. Truman K. Gibson, Jr., Civilian Aide on Negro Affairs to the Secretary of War, in recommending the establishment of a special Secretary of War commission to control venereal disease in Negro troops. This proposed commission was to have a central advisory staff directly under the control of the Secretary of War and a field staff of specially trained Negro officers to operate as "trouble shooters," but the recommendations were never placed into effect.

Summary and Evaluation of Control Program

The Negro venereal disease rate for the year 1943 for troops in the continental United States was 136 per 1,000 per annum; the rate in 1944 was 159 and that in August 1945, 309. Results of serologic tests for syphilis of white and Negro Army personnel at time of separation are presented in table 18 for the period May 1945 to September 1945 (a much shorter period than that covered by the data of table 15). During this period, slightly more than 400,000 persons were separated, distributed by race as follows: 374,161 white separatees and 26,785 Negro separatees. These figures illustrate better than words the failure of the effort made to control venereal disease in Negro

TABLE 18.—*Results of serologic tests for syphilis of U.S. Army personnel at time of separation, by race, May–September 1945*

[Rate expressed as number of serologic reactions per 1,000 separatees]

Serologic reaction	White separatees		Negro separatees		Total	
	Reactions	Rate	Reactions	Rate	Reactions	Rate
Without history of syphilis:	*Number*		*Number*		*Number*	
Positive	2, 011	5. 4	1, 075	40. 1	3, 086	7. 7
Doubtful	1, 505	4. 0	313	11. 7	1, 818	4. 5
Total	3, 516	9. 4	1, 388	51. 8	4, 904	12. 2
With history of syphilis:						
Positive or doubtful	613	1. 6	890	33. 2	1, 503	3. 7
Negative	2, 579	6. 9	1, 529	57. 1	4, 108	10. 3
Total	3, 192	8. 5	2, 419	90. 3	5, 611	14. 0
Total, positive or doubtful	4, 129	11. 0	2, 278	85. 0	6, 407	15. 9
Total, negative with history of syphilis	2, 579	6. 9	1, 529	57. 1	4, 108	10. 3
Grand total	6, 708	17. 9	3, 807	142. 1	10, 515	26. 2

troops during World War II. Except for isolated instances of success, the history of venereal disease control in Negro troops was one of frustration and failure. It was apparent throughout the war that the high Negro venereal disease rate was only one facet in a complex social and economic problem and that, without a solution of the fundamental underlying factors, efforts to control venereal disease in Negro troops by films, directives, schools for noncommissioned officers, disciplinary action, and other measures could not be successful. These measures could only influence the fringe of an enormous problem. The failure to control venereal disease among Negroes in the Army was, at least in part, a reflection of the failure of society through individual and governmental efforts to develop a satisfactory race relationship between the white and Negro populations.

PROPHYLAXIS

Early Developments

The provision of prophylaxis against venereal disease through prophylactic stations and the sale of prophylactic materials at post exchanges had been accepted Army control procedure for many years before World War II. AR 40–235, 11 October 1939, directed commanding officers to establish prophylactic stations at suitable locations within each command and, when facilities permitted and necessity therefor existed, to establish such stations in adjacent civilian communities. The regulations also directed that post exchanges make available suitable materials for individual prophylaxis, the composition and quality of the material to be prescribed by the commanding officer upon the recommendation of the surgeon. Two manuals, War Department Field Manual 8–40, Field Sanitation, 15 August 1940, and War Department Technical Manual 8–220, Medical Department Soldier's Handbook, 5 March 1941, described in further detail the operation of prophylactic stations and the method of applying prophylaxis. The basic drugs employed were 2 percent Protargol, and 30 percent calomel, supplemented by 1:1,000 solution of mercury bichloride and soap and water.

This policy of providing prophylaxis against venereal disease for those individuals who exposed themselves was criticized on numerous occasions by church groups and other civilian representatives on the basis that it incited to promiscuity and was inconsistent with the educational program which emphasized continence and the danger of the venereal diseases. Characteristic of these criticisms was a letter from Bishop John F. O'Hara, Military Delegate to the Military Ordinariate of the Roman Catholic Church in the United States, to the War Department criticizing the use of contraceptives. Characteristic also of the War Department's position on the matter was the following proposed reply to Bishop O'Hara, which was prepared by The Surgeon General: [30]

[30] Memorandum, The Surgeon General to the Secretary, General Staff, War Department, Washington, D.C., 18 Apr. 1941.

I have read with interest your thoughtful letter concerning the use of contraceptives for venereal prophylaxis in the Army and the attitude of certain officers regarding prophylaxis and continence among soldiers, and I appreciate fully the motives which moved you to take up this matter.

You may be assured that there is no inclination on the part of the War Department to minimize the importance of the moral aspects of the venereal disease problem. However, in the interest of military efficiency, this problem must also be considered in the same manner as any other disease. The men are in the Service for training, and time lost is a serious matter. Since venereal diseases constitute a most serious cause of lost time, every reasonable means of reducing such infections must be employed. The results obtained over the last twenty-five years indicate that venereal prophylaxis is an effective method.

The measures now in force are the result of continuous study and evolution since the beginning of our Army, and the present program of venereal disease control is generally conceded to be the most effective one yet developed. The present policy follows well established lines including: education (stressing the importance of continence), case-finding, treatment (prophylactic and specific), segregation of infectious individuals, the suppression of prostitution, and the provision of wholesome recreational facilities. The removal of any of these measures would weaken this program which has resulted in such a dramatic reduction of venereal diseases in the Army.

It must be recognized that regardless of what advice is given an unknown proportion of men will expose themselves to the hazard of venereal contagion. For such individuals the Army advocates the use of mechanical and chemical prophylactics, not as contraceptives, but solely as an effective procedure for the prevention of infection. A committee of specialists in the control of venereal disease, appointed by the American Social Hygiene Association and the United States Public Health Service, in September 1940, indorsed the use of the rubber condom as the safest method of venereal prophylaxis.

There is some question as to indiscriminate distribution or open sale of prophylactic kits at post exchanges. Those supplied by the Army are only for the protection of the soldier, and it is insisted that such as are sold at post exchanges must be of good quality. This affords better protection against infection than would otherwise be obtained, as it discourages their purchase in poolrooms, filling stations, etc., which frequently sell articles of inferior quality.

In conclusion, I assure you that while certain individual officers may have expressed personal views to the contrary, the War Department recognizes that the only perfect method of preventing venereal diseases is continence, and that for moral and physical reasons it is officially in favor of chastity among troops.

An extensive correspondence between members of Congress and the War Department in connection with prophylaxis continued in 1941 following the publication of War Department Field Manual 21–10, Military Sanitation and First Aid. Of particular concern to Congressmen and their constituents was paragraph 80 *d* of this field manual which follows:

d. Prophylactic measures. (1) Mechanical.—The condom affords the only practical mechanical protection against venereal infection. Post exchanges are required to stock condoms of approved quality. A condom will prevent gonorrheal infection which must enter the urethra. It is not certain protection against syphilis, chancroid, or lymphogranuloma inguinale which may enter the skin and tissues about the genitals. Consequently, chemical prophylaxis must be given even after a condom has been used.

On 27 August 1941, for example, the Honorable Robert R. Reynolds sent to The Surgeon General communications from several individuals with regard

to the statements found in paragraph 80 *d* of FM 21–10. The Surgeon General, in his reply on 28 August, made the following statements:

> The Army's acceptance of the rubber sheath as the most effective individual prophylactic is a result of years of medical observation. Civilian medical authorities agree in recommending this method. The best recent statement of this opinion may be found in a report of the Special Joint Committee, appointed by the American Social Hygiene Association and the United States Public Health Service, published in the October 1940 issue of Venereal Disease Information * * *.
>
> In the educational material on sex hygiene and venereal disease provided to troops, emphasis is always placed on continence and high moral standards. To insure this Army regulations require that a chaplain take part, with the commanding officer and the medical officer, in the periodic instruction. A certain proportion of soldiers in any group will reject this advice and expose themselves to the possibility of venereal contagion. For these the Army makes available the best prophylactic measures known. No soldier is forced by regulations or orders to use these measures, nor does the Army issue any type of individual prophylactic.

Later Procedures

As the war progressed, the necessity for providing prophylactic measures as one phase of the venereal disease control program became evident to most of the critics, and incoming correspondence protesting the use of prophylaxis was gradually reduced to a minimum. Accepting prophylaxis as a necessary measure, the War Department recognized serious deficiencies in the program as it was established at the beginning of the war and took steps to eliminate them. Thus, by 1945, The Surgeon General had been designated as the officer responsible for determining quality and composition of prophylactic materials, a new single-tube sulfathiazole-calomel individual chemical prophylactic had been developed, and the method of distribution was fundamentally changed—prophylactic materials were made a standard Medical Department item, and provision was made for free issue of these materials through medical supply channels.

Development of individual chemical prophylaxis.—No suitable individual chemical prophylactic kit was available for sale at post exchanges in 1940. Calomel ointment for protection against syphilis had been sold for many years, but this drug had no preventive action against gonorrhea or the other venereal diseases. On 2 January 1942, Mr. E. J. Schabelitz of Schabelitz Research Laboratories wrote to The Surgeon General submitting samples of a product developed by his research laboratories containing, among other drugs, 0.25 percent silver picrate jelly for protection against gonorrhea. Mr. Schabelitz' letter referred to the successful use of the drug at several naval installations, particularly at the Central Prophylactic Station, San Diego, Calif., and his letter recommended its sale throughout Army post exchanges. The material was forwarded to the National Research Council for consideration.[31] In a memorandum dated 7 January 1942, Major Gordon advised Colonel

[31] Letter, Lt. Col. John A. Rogers to Dr. Lewis H. Weed, Division of Medical Sciences, National Research Council, 10 Jan. 1942.

Simmons concerning the current status of silver picrate as a gonorrhea prophylactic.

According to Major Gordon, silver picrate was included in New and Nonofficial Remedies—1940, and Knight and Shelanski had found silver picrate to be effective in the treatment of gonococcal urethritis.[32] Comdr. R. A. Nolan, MC, U.S. Navy, had introduced the use of 0.5 percent silver picrate jelly as a substitute for silver proteinate solution in station prophylaxis at several places on the west coast and had published the results in 1941, calling this new method the V Plan. Further experiences of Commander Marsh indicated that the use of 0.25 percent silver picrate jelly was at least as effective as the standard silver proteinate.[33] Commanders Nolan, Marsh, and Boone had recommended the adoption of a supplementary individual chemical prophylaxis in the form of a packet such as those prepared by John Wyeth & Bro., Inc., and the Schabelitz Laboratories, the packet containing soap-impregnated gauze, a tube of silver picrate jelly, and a tube of calomel ointment. Furthermore, the Philadelphia Department of Health was making use of the Wyeth V-Packette in providing prophylaxis through hospital emergency rooms, and this service had been accepted by the Commanding General, Third Corps Area. In conclusion, Major Gordon made the following qualified recommendations:

> In view of the recognized and unavoidable hazards of mechanical prophylaxis and the impossibility of scattering station prophylaxis facilities sufficiently to provide this service at a convenient distance from each place of contact, it would appear that this method should have serious consideration as a possible adjunct to the present prophylaxis armamentarium. I do not feel that it is desirable to recommend this method of individual chemical prophylaxis as the sole reliance, supplanting the mechanical prophylaxis, but there appears to be no reasonable objection to the acceptance of additional effective methods which may be available in order to make protection as complete as possible.

By March 1942, the use of the 0.25 percent silver picrate Wyeth's V-Packette had been approved in a branch of the Air Corps.[34] On 27 March 1942, a communication from The Surgeon General to the Quartermaster General recommended an individual chemical prophylactic packet containing silver picrate for oversea troops. On 31 July 1942, in Circular Letter No. 80, The Surgeon General further recommended a silver picrate prophylactic packet for general distribution in Army post exchanges. In addition to the silver picrate, calomel, a soap-impregnated cloth, and an instruction sheet were recommended for inclusion in the packet. It was noted that existing evidence indicated that no single-tube chemical prophylactic was a satisfactory substitute for the soap-silver-mercury combination. Shortly after the publication of this letter, several pharmaceutical houses produced packets conforming to

---

[32] Knight, F., and Shelanski, H. A.: Treatment of Acute Anterior Urethritis With Silver Picrate. Am. J. Syph., Gonor. & Ven. Dis. 23: 201–206, 1939.

[33] Letter, Lt. Comdr. J. A. Marsh, MC, USN, to Dr. J. F. Mahoney, Director, Venereal Research Laboratories, Marine Hospital, Staten Island, N.Y., 27 Nov. 1941.

[34] Letter, Maj. James H. Gordon to Lt. Comdr. K. P. A. Taylor, MC, USNR, Office of the Commandant, 15th Naval District, Balboa, Canal Zone, 26 Mar. 1942.

the specifications of the individual chemical kit prescribed, and post exchanges throughout the Army made them available to military personnel.

A few weeks after the initiation of widespread sale of these kits containing a tube of silver picrate, it became painfully evident that silver picrate was not a satisfactory gonorrhea preventive because its use was attended by irritation, occasionally to the point of nonspecific chemical urethritis. Furthermore, the whole prophylactic procedure was complicated, and the drug stained and was unstable. The development of a suitable single-tube ointment which protected against both gonorrhea and syphilis without producing irritation now became one of the most urgent needs of the control program.

The PRO-KIT combining sulfathiazole and calomel in a nonirritating, nongreasy ointment base was the final product of an intensive, coordinated research effort conducted by the Army, the National Research Council, the Food and Drug Administration, and the Warner Institute for Medical Research. Initially, early in 1943, a combined sulfonamide-calomel ointment of uncertain composition was developed in Liberia by Capt. (later Lt. Col.) Thomas G. Faison, MC, who recommended its adoption in the Army in a letter to The Surgeon General on 19 April 1943 (pp. 273–274). The problem was referred to the Subcommittee on Venereal Diseases of the National Research Council which recommended at its 19th meeting on 10 June 1943 that immediate studies be undertaken to prepare a satisfactory ointment. The resources of the Warner Institute for Medical Research, through Dr. Marvin Thompson, and of the Food and Drug Administration, Federal Security Agency, through Dr. H. O. Calvery, were placed at the disposal of the Army. Within a short time, two ointments had been developed which were submitted to field trials. On 17 February 1944, the National Research Council recommended [35] that, if by 4 April the experience gained from the field trials was sufficient to warrant a choice, one of the products be adopted for a standard individual chemical prophylaxis. In a memorandum to General Simmons on 28 March 1944, Colonel Sternberg reviewed the status of the chemical prophylaxis program and recommended adoption of the combined sulfathiazole-calomel ointment. The salient points of Colonel Sternberg's memorandum are summarized below:

1. During the past 8 months, the Venereal Disease Control Branch had accumulated data on the results of field trials of the new calomel-sulfathiazole ointment to be used in preventing venereal diseases. Sufficient information was now available to evaluate the efficacy of the new ointment and to have it considered for adoption as a standard venereal disease prophylactic in the Army.

2. The ointment had been used in widely separated areas and under conditions which provided for careful observation and followup. Particular attention had been directed toward finding any evidence of failure to protect

[35] Minutes of Conference on Chemical Prophylaxis of Venereal Diseases, National Research Council, Division of Medical Sciences acting for The Committee on Medical Research of the Office of Scientific Research and Development, 9 Feb. 1944.

and of local and systemic reaction to the drugs used. In addition to field trials, experimental animal and laboratory studies carried out under the supervision of the National Research Council Subcommittee on Venereal Diseases had confirmed the effectiveness of the combination of calomel and sulfathiazole in preventing syphilis and gonorrhea. The Subcommittee on Venereal Diseases would recommend the adoption by the Army of this new prophylactic.

3. Of reports reviewed to date, the total number of prophylactics that had been given was 16,537 among which had been 27 failures—only 0.16 percent of the total.

4. The calomel-sulfathiazole prophylactic ointment enjoyed wide acceptance and approval from men using it. In some areas, a 300-percent increase in prophylactic rates was reported. Besides proving to be an effective preventive for venereal diseases, the new ointment had advantages over the older two-tube chemical prophylactic in that only a single tube was required, it was nonirritating and caused no burning when inserted in the urethra, and it was nonstaining—the vanishing cream base did away with the need for protective clothing. Moreover, it was simple to use and required less time for proper use.

5. In view of the excellent reports from field trials and laboratory work, it was recommended that the new venereal disease prophylactic ointment be adopted as standard for use in the Army and be included in individual chemical prophylactic packets for distribution in all military areas.

On 18 April 1944, Colonel Sternberg advised the Director, Technical Division, Office of the Surgeon General, that the new chemical prophylactics be distributed in a kit with the notation "PRO-KIT" on the outside. Thus, the development of a satisfactory single-ointment prophylactic effective against both gonorrhea and syphillis reached a successful conclusion. The PRO-KIT was the most important venereal disease preventive measure developed during the war.

Mechanical prophylaxis.—No important changes other than method of distribution occurred in the mechanical prophylaxis program. Assistance in providing condoms of the best quality was provided by Circular Letter No. 4, Office of the Surgeon General, dated 8 January 1940, which specified in detail the tests and specifications that condoms must meet before being sold by post exchanges. Subsequently, when the mechanical prophylactic kit was made a standard Medical Department item, approval of the Food and Drug Administration was obtained in advance of distribution.

Station prophylaxis.—Official Army prophylactic stations constituted an integral part of the venereal disease control program in 1940. The procedures followed in the stations were described in technical and field manuals (p. 196). Never entirely satisfactory because of the relatively prolonged procedure and the objection of many individuals to urethral injection of 2 percent Protargol solution because of irritation and pain, the prophylaxis provided at stations was, nevertheless, a useful adjunct. No change was made in the basic prophy-

559625v—61——15

laxis, even after the development of the PRO-KIT. The recognized desirability of replacing the Protargol-calomel regimen with sulfathiazole-calomel was never effected because of the problem of supply presented by the PRO-KIT. Late in 1945, after V–J Day, the supply of PRO-KIT's improved and plans were made to introduce them into prophylactic stations in place of Protargol and calomel.

Centralization of responsibility.—An important advance in the prophylaxis program was the placing of responsibility for furnishing and recommending prophylactic materials upon The Surgeon General by Changes No. 1, AR 40–210, on 8 December 1942. The previous confused situation created by the delegation of responsibility to local commanding officers was eliminated by this change.

Compulsory prophylaxis.—In many posts, commanding officers were resorting to compulsory methods of distributing prophylactic materials, a practice which met severe criticism from civilian sources and was contrary to the policy of The Surgeon General. A letter was therefore submitted on 24 January 1942 by The Surgeon General to The Adjutant General recommending that action be taken to prevent further use of compulsion in the matter of individual prophylaxis. This policy was later included in Changes No. 3, AR 40–210, dated 1 May 1943.

Distribution of prophylactic packets.—Major changes were made in the method of distribution of prophylactic materials. Briefly, prophylactic packets were initially provided through post exchanges. Later, authority was given commanding officers to purchase the kits from the exchanges out of company funds and distribute the kits through company facilities. Finally, the kits were made a standard Medical Department item, and free distribution was made through regular medical supply channels.

Oral sulfathiazole prophylaxis.—The use of sulfathiazole by mouth as prophylaxis against gonorrhea was considered by many investigators, civilian and military, soon after its introduction for the treatment of gonorrhea. Fort Benning, Ga., and the Armored Forces, Fort Knox, Ky., pioneered in the use of the drug as a prophylactic agent against gonorrhea.

On 24 September 1942, Headquarters, Armored Forces, Fort Knox, published Memorandum No. 152 on the overall control of communicable disease. The following paragraph pertaining to sulfaprophylaxis was included:

> 5.c. It is recommended that all men exposed more than one hour prior to taking prophylaxis be given a two-gram dose of sulfathiazole, followed by two one-gram doses at four-hour intervals. This method of complementing the routine prophylaxis has been tried in several Armored Forces units, and it has been noted that the venereal rates for these units have dropped to an almost irreducible minimum.

This recommendation was not in conflict with any published War Department directive, but neither was it specifically authorized. For this reason, the newly assigned surgeon of the Armored Forces, Col. Alvin L. Gorby, MC, called the Office of the Surgeon General, requesting informally the reaction of The

Surgeon General to this Armored Forces memorandum. No objection was expressed to the "experimental" use of the drug.

In the field, however, Armored Forces units were meeting obstruction from post surgeons and supply officers who, in some instances, refused to release the drug for prophylactic purposes. Thus, the project was brought to the attention of The Surgeon General who, in an endorsement to the Commanding General, Army Ground Forces, on 4 February 1943, established the following policy: [36]

1. The oral administration of the sulfonamide drugs for venereal disease prophylaxis is not approved for general use in the Army.

2. Approval may be given for use of the drug for this purpose on a trial basis under conditions which will permit evaluation of the results as regards prophylactic efficacy and toxic effects.

3. Its use should be confined to units which have shown a venereal disease rate of over 30 per 1,000 per year, the total dose of sulfathiazole for one exposure should not exceed 4 grams, and not more than one prophylactic "course" should be given in any one week.

4. Administration before exposure should be avoided.

Concurrently with the Armored Forces prophylaxis project, experiments were being conducted at Fort Benning with two groups of soldiers, one of which received oral sulfathiazole prophylaxis while the other served as a control. The results were encouraging, and the material was submitted to The Surgeon General in the form of a paper which was later published in the *Journal of the American Medical Association*.[37]

In the meantime, the Armored Forces submitted a favorable report on their studies and recommended routine adoption.[38]

Only one adverse report was submitted, a report which delayed authorization of oral sulfa prophylaxis by several weeks. In this case, a study was initiated by the Fourth Service Command medical laboratory at the direction of Headquarters, Fourth Service Command, to determine whether prolonged adminstration of sulfathiazole in the dosage used at Fort Benning produced blood or kidney pathological changes. The initial report indicated a high percentage of hematuria in the test group and a complete absence of such findings in the control group. This report threatened to cause the immediate discontinuance of the whole project. Fortunately, this unfavorable development was avoided by the submission of a subsequent study by the Fourth Service Command medical laboratory which not only failed to confirm the

---

[36] Letter, Capt. William E. Sutton, MC, Battalion Surgeon, Headquarters, 750th Tank Battalion (L), to Commanding Officer, 750th Tank Battalion (L), Fort Lewis, Wash., 7 Oct. 1942, with 10th endorsement The Surgeon General to Commanding General, Headquarters, Army Ground Forces, Army War College, 4 Feb. 1943.

[37] Loveless, J. A., and Denton, W.: The Oral Use of Sulfathiazole as a Prophylaxis for Gonorrhea. J.A.M.A. 121: 827–828, 13 Mar. 1943.

[38] Letter, Commanding General, Headquarters, Armored Forces, to The Surgeon General, 22 Feb. 1943, subject: Report of Use of Sulfathiazole as a Prophylactic Agent, with endorsements thereto.

previous report but strongly suggested that the first investigator was guilty of defective laboratory technique and preconceived notions.

On 28 July 1943, it was recommended that oral sulfathiazole prophylaxis for gonorrhea be authorized, and on 12 August 1943 Circular Letter No. 146, Office of the Surgeon General, U.S. Army, was published, concerning the subject.

Sulfathiazole prophylaxis was used widely throughout the Army during the remainder of the war. Its use was attended by success in many instances, but considerable opposition was also expressed by many officers who preferred to rely upon other preventive measures. The principal defect of the sulfonamide prophylaxis program was the need for carefully supervised and executed local administrative control. The tablets were often used for purposes other than prophylaxis, and other abuses were observed. In general, it may be said that this prophylactic program was a valuable adjunct to the control of venereal disease during World War II but that its successful utilization required painstaking supervision.

THOMAS H. STERNBERG, M.D.
ERNEST B. HOWARD, M.D.

Part II. Mediterranean (Formerly North African) Theater of Operations

ORGANIZATION AND ADMINISTRATION

In the available records of planning before the invasion of North Africa, there is no indication that any consideration was given to the problem of venereal disease control at the theater level. A preventive medicine officer was included on the original staff of Allied Forces Headquarters, but no mention is made of the consideration or adoption of any overall policy regarding venereal disease control. If any thought was given to the problem before the invasion, the decision was apparently made to defer policymaking until such time as it could be guided by actual experience.[39]

During November and December 1942, venereal disease control policies were developed and carried out by various units in the areas occupied by them. Medical officers in these units were designated as venereal disease control officers, though few of them had any previous training or experience in this line of work. Until January 1943, no attempt was made to coordinate venereal disease control activities in the theater nor to develop overall theater policies. On 3 January 1943, Lt. Col. (later Col.) Perrin H. Long, MC, was assigned to Allied Forces Headquarters as consultant in medicine, and he, with Lt. Col. John R. Norton, Preventive Medicine Officer, took initial steps toward coordination of the program. A brief form for reporting venereal disease contacts was developed and was required to be submitted on each

[39] Annual Report, Medical Section, North African Theater of Operations, U.S. Army, 1943.

venereal disease case in order that information might be collected regarding chief sources of venereal disease. Meetings were held with civil authorities, and recommendations were made regarding the prostitution problem in the theater. In February, Colonel Long's recommendation [40] that all brothels be placed off limits was unfavorably considered by the command.

In March 1943, Lt. Col. (later Col.) Leonard A. Dewey, MC, was assigned as full-time venereal disease control officer for the theater with responsibility for supervision of venereal disease control and treatment. Late in March 1943, six additional medical officers with special training and experience in venereal disease control arrived in the theater and were assigned to headquarters of major organizations as follows:

Lt. Col. Asa Barnes, Atlantic Base Section, Casablanca.
Maj. James E. Flinn, Mediterranean Base Section, Oran.
Capt. William E. Flood, Twelfth Air Force, Algiers.
Maj. John G. McNiel, Eastern Base Section, Constantine.
Lt. Samuel S. Frank, XI Corps, Tunisia.
Capt. Thomas R. Hood, Fifth U.S. Army, Oujda.

These officers worked on the staffs of the surgeons in the headquarters concerned and supervised venereal disease control activities in areas under the jurisdiction of these headquarters. All major organizations in the theater were thus supplied with the services of a trained and experienced venereal disease control officer, and each major city in the theater with the exception of Algiers, which was under British control, was covered by one of these officers. Changes in assignments were later necessitated by reorganizations and tactical progress, and a specific position vacancy was seldom provided in tables of organization. However, the general principle of maintaining a venereal disease control officer on the staff of each major organization was continued throughout the North African and Italian campaigns.

The Twelfth Air Force Surgeon used his chief of preventive medicine as the venereal disease control officer. The Fifth U.S. Army during the first half of the year had two different officers assigned to venereal disease control. Neither of these officers was trained as a venereal disease control officer, and both moved on to other assignments leaving the venereal disease program to the already heavily burdened chief of the preventive medicine section. The Island Base Section on Sicily, where venereal disease rates were among the highest in the theater, never had a position vacancy on the staff of the base section surgeon for a venereal disease control officer.

To remedy this situation, an effort was made to set up a venereal disease control unit under the theater headquarters to include a definite table of organization with both commissioned and enlisted personnel. The commissioned personnel were to be attached to the staffs of surgeons of armies, base sections, and air forces on temporary duty. The enlisted personnel were to be organized into platoons to provide educational and prophylactic facilities.

[40] Long, Perrin, H.: Historical Report Upon Activities for the Control of Venereal Disease in the North African Theater of Operations, From 3 January 1943 to 8 March 1943. [Official record.]

It was agreed in the Office of the Surgeon, NATOUSA (North African Theater of Operations, U.S. Army), that this sort of organization was to be desired for any specialized program, but it was impossible to get approval for the organization within the theater. The enlisted personnel desired were later provided under War Department Table of Organization and Equipment 8–500, dated 26 July 1943, and were attached to the army, base section, and air force in which they were used, under the supervision of the venereal disease control officer, for the operation of prophylactic stations in metropolitan areas.[41]

PROSTITUTION AND ITS CONTROL

General situation in North Africa.—In all of the countries bordering the Mediterranean, a well-organized system of governmental regulation of prostitution had existed and had been in operation for years before the arrival of U.S. troops. In French North Africa, Sicily, and Italy, prostitutes were registered, given periodic medical inspections, and treated when found infected. These measures, Colonel Long reported, constituted almost the entire venereal disease control program carried on in the civilian population of these countries.

No estimate can be made as to the total number of registered prostitutes in North Africa at the time of the invasion other than that the number was huge. Every community of greater than hamlet size had several registered prostitutes, and the larger cities had hundreds. According to Colonel Long, Algiers, Algeria, had 600 registered prostitutes, and Casablanca, French Morocco, 1,500. Oran, Algeria, had 450 registered prostitutes.

Registered prostitutes were divided into two classes: "Incrites soumises," or those operating in recognized houses of prostitution; and "Incrites insoumises," those registered but operating as free lancers. Either prostitutes were registered at their own request or registration was compulsory if a girl was arrested on a morals charge more than one time. Once registered, a prostitute was not allowed to engage in any other occupation unless registration was officially canceled by the authorities. Registration could be canceled upon recommendation of two citizens of good repute, in which case the girl was allowed to marry or to engage in the occupation of her choice. In either case, it was necessary that all arrangements be completed for the new occupation before registration could be canceled.

All registered prostitutes were handled in the same manner. They were required to report to the local health center twice each week for medical inspection which ordinarily consisted of a cursory inspection of the skin and a speculum examination of the vagina and cervix. According to Colonel Long, these inspections were carried out very rapidly, from 75 to 100 being accomplished in an hour. Standard operating procedure called for a cervical smear to be taken at each visit, to be stained with methylene blue and examined

---

41 Annual Report, Medical Section, Headquarters, Peninsular Base Section, NATOUSA, 1943.

immediately. A serologic test for syphilis was also to be done every 3 months on each registrant. Observation of the examinations in Algiers and Oran showed that they were not carried out as planned. A smear was made on not more than 1 in 10 individuals examined, and very poor technique was used in taking and examining the smears. No smear was made unless purulent discharge was evident. In Oran, girls waiting in line were observed sponging out their vaginas preparatory to examination. Under such conditions, purulent discharges were seldom seen. A similar laxness existed in the program for the serologic testing of prostitutes. Examination of the records revealed that many prostitutes had received no serologic test for more than 6 months.

Treatment of those found infected ranged from poor to totally ineffective. The best treatment program existed in Algiers where sulfapyridine was used for the treatment of gonorrhea and sulfarsphenamine and bismuth were used for the treatment of syphilis. Gonorrhea patients received 3 days of treatment and were discharged as cured if one negative smear was secured on the day following completion. Colonel Long stated that this practice without doubt caused the discharge of many infectious patients. Among the syphilis patients, none were found who had received adequate therapy according to American standards, even had a more potent arsenical been used. Neoarsphenamine was available in Algiers, but sulfarsphenamine was used almost exclusively because it was considered more effective.

In addition to the registered prostitutes, there were numerous clandestine prostitutes who made prostitution their sole or chief source of income. These operated in hotels and cafes and, to a lesser extent, on the streets in all cities in North Africa. No governmental control was exercised over this class except when they were occasionally apprehended by police and brought into the registered class. According to French civil authorities, clandestine prostitution had always existed in the larger cities but had increased considerably since the fall of France. Refugees had poured in from all countries of Europe, and, for many of these individuals, prostitution was the only available source of livelihood. After the American occupation, the number was further increased as a result of the inflation caused by scarcity of goods and American spending. It was necessary for many domestic servants, earning 800 francs ($16) per month, and typists, earning 2,000 to 3,000 francs ($40 to $60) per month, to supplement their incomes. A girl had no difficulty in earning 500 francs a day as a prostitute, and many of the more attractive made 2,000 francs or more per day. This, according to Colonel Long, was naturally the means chosen by most of the underpaid female workers to supplement their incomes.

When confronted with the widespread prostitution just described, the U.S. authorities considered two possible sources of action. Suppression of prostitution was first considered but was immediately abandoned as impractical because of the magnitude of the problem and because the civil authorities were very unsympathetic to the idea. The second course considered was to

place certain areas off limits to U.S. troops but to allow them free access to certain of the better houses of prostitution over which close supervision was maintained. This was the course which was adopted immediately after the invasion and was continued for various periods of time in the several areas.

Casablanca.—In Casablanca, French Morocco, the native quarters of Medinas (fig. 26) which contained all of the established houses of prostitution were placed off limits to U.S. troops on the day of occupation and remained so until 10 December 1942. On 10 December 1942, the famous walled city in the New Medina was opened to U.S. troops, and prophylactic facilities were provided for their protection. The walled city occupied an area of approximately four city blocks in the New Medina and was surrounded by a 30-foot wall topped with broken glass. It housed some fifteen hundred registered prostitutes who were strictly confined within the walls. Male patrons were admitted through a single gate at which was located a French prophylaxis station where the men could obtain prophylaxis if they desired. A clinic and hospital were located within the walls at which inmates received the usual inspections and, when deemed necessary, treatment as well. The walled city remained open for 3 days—10, 11, and 12 December 1942—and was again placed off limits on 13 December. Disturbances arising among the troops in the walled city were responsible for this action. The walled city and all other brothels in Casablanca remained off limits from 13 December 1942 throughout the occupation.

Oran.—In Oran, Algeria, the native brothel section was put off limits immediately after the invasion and a number of the better type of European brothels were selected for the use of U.S. troops. Seven brothels in rue d'Aqueduc were set aside for the use of white troops, and a large prophylaxis station was set up in a brothel near the entrance to the street, which was a blind street. Two additional brothels in slightly different sections of the city were selected for white troops, and two were set aside for Negro troops. Prophylaxis stations were established in each of these, and men were required to take a prophylaxis before leaving. An added restriction placed on Negro troops was that they be in the house not longer than 30 minutes. Military police were stationed within the brothels to enforce regulations. Americans were allowed to patronize the houses between 1700 and 2100 hours. At other times the brothels were supposed to be closed under an agreement made between the civil authorities, madams, and U.S. authorities. This agreement was not adhered to, however, and the houses were ordinarily open to civilian trade during other hours of the day and night.

This system was established because it was believed that the prostitutes employed in brothels were freer of infection than those on the outside. This belief was based on the report of the examination of prostitutes in Oran by the civilian health authorities for the third trimester of 1942. This report showed the rate of infection to be 0.61 percent among brothel inmates, 16.4 percent among registered prostitutes operating outside of brothels, and 16.4

FIGURE 26.—Old Medina, Casablanca. This native section of the city was declared off limits to U.S. Army personnel.

percent among clandestine prostitutes. It was later discovered that, when brothel inmates were reported as sources of venereal disease, they were always found to be free of infection by the civilian examiner, even when a previous examination by a U.S. Army medical officer had shown infection. As a

559625°—61——16

result of this finding, arrangements were made with civil authorities in April to hire a refugee physician with good professional background to examine all girls reported as contacts of U.S. Army personnel with venereal disease.

The brothels in Oran operated under this system almost continually until 28 May 1943, and, as prophylactic records indicate, did a flourishing business. In December, 15,265 prophylactic treatments were administered in the stations within the brothels, and, by March 1943, the number had risen to over 46,000. While the houses were in operation, many individuals with venereal disease stated that their infections had been acquired within these houses. This seemed probable because the prophylaxis stations were overloaded and the treatments were very poorly administered. Frequent recommendations were made that the system be discontinued and the houses be placed off limits, but no consideration was given to this proposal until April, when most of the brothels in Oran were closed for 18 days because of a shortage of water. It was noted that an appreciable drop in new venereal disease admissions occurred during and immediately following this period. As a result, an off-limits directive was issued on 28 May 1943, after which a 50-percent drop in venereal disease rates occurred.

Algiers.—A somewhat different system was adopted in Algiers, Algeria. The native quarter, or casbah, was placed off limits at once, not particularly as a venereal disease control measure but because it was regarded as too dangerous a place for U.S. troops to visit. Four large brothels and a large number of small hotels, each housing 1 to 3 prostitutes, operated outside the casbah, and these remained on limits to troops. No attempt was made to provide prophylactic facilities in conjunction with these brothels, but a prophylaxis station was established in the same general section of town. The largest and most ornate of these brothels, the Sphinx, was reserved by the management for Allied officers during the evening hours, but enlisted men and civilians were admitted during the daytime. This system was regarded as unsatisfactory and many cases of venereal diseases were attributed to the brothels by troops in the area, but the system was not changed until late July 1943 when the brothels were officially placed off limits. Enforcement, however, was rather lax.

Eastern Algeria and Tunisia.—In the Eastern Base Section, comprising eastern Algeria and, later, Tunisia as well, the prostitution problem was much less important than in other sections of North Africa.

At the close of the Tunisian campaign, the base sections in North Africa, in general, had established off-limits and repression policies in dealing with the problem of prostitution, while in other areas selected brothels continued to be regulated and supervised. In November, a survey was made of venereal disease rates in the various organizations in North Africa, and a comparison was made between those maintaining a regulation and supervision policy on the one hand and those maintaining an off-limits policy on the other. It was found that rates in organizations with an off-limits and repression policy

were consistently lower by 15 to 40 percent than those in organizations which supervised and regulated prostitution. The survey indicated that the chief effect of supervision and regulation was to produce a huge number of sexual contacts within the houses without materially reducing contacts on the outside. There was no indication that supervision and regulation of prostitution could be considered a venereal disease control measure by any stretch of the imagination.[42] On the basis of this survey, it was recommended to the commanding general that placing of brothels off limits and repression of prostitution be adopted as theater policy, but this recommendation was not approved.

Sicily.—After the conclusion of the Sicilian campaign, conditions similar to those formerly encountered in North Africa but greatly magnified were met. Inflation was more severe, and there had been a much more serious disruption of normal civilian activities (fig. 27). Drugs and medical care had been grossly deficient for several years, and the incidence of venereal diseases among the civilian population was extremely high. In Sicily and Italy, only very limited quantities of sulfanilamide had been available during the 2 years preceding U.S. occupation. No other sulfonamide drugs at all had been available. This resulted in totally inadequate treatment of gonorrhea with an inadequate drug, which in all probability gave rise to sulfonamide-resistant strains of the gonococcus. At any rate, gonorrheal infections contracted in Italy and Sicily by U.S. troops were much less responsive to sulfonamide therapy than the infections contracted in Africa had been. The incidence of sulfonamide resistance in Italy was approximately 60 percent as compared to a resistance of approximately 25 percent in North Africa.[43]

Prostitution was almost universal among all but the highest class of Sicilian women. Government-regulated brothels also existed in all of the larger towns—brothels which in normal times were operated under a system practically identical with that used in North Africa but which had largely broken down as a result of the stress of war.

Immediately after the cessation of hostilities in Sicily, brothels in the larger communities were taken over for the exclusive use of U.S. troops. In Palermo, the chief center for U.S. troops, six houses of prostitution were selected for U.S. troops and put in operation during the first week in September 1943. Prostitutes were examined twice weekly by a Sicilian physician and less frequently by a U.S. Army medical officer. Prophylactic stations were established within or adjacent to each house, and military police were stationed at each house to maintain order and to insure that each man received prophylaxis before leaving.[44] In spite of this program, venereal dis-

[42] Dewey, A. L.: Venereal Disease Control—A Survey. M. Bull. Mediterranean (North African) Theat. Op. No. 1, 1: 33–35, January 1944.

[43] (1) Essential Technical Medical Data, NATOUSA, for December 1943, appendix Q. (2) History of Fifth Army Medical Service, MTOUSA, 1945.

[44] Letter, Lt. Col. Leonard A. Dewey, MC, to The Surgeon, NATOUSA, 20 Oct. 1943, subject: Report of Inspection of Venereal Disease Control and Treatment in the Palermo Area, October 13 to 17.

FIGURE 27.—A market street in Palermo, Sicily.

ease rates in the Seventh U.S. Army rose steadily from 31 per 1,000 per annum in August to 119 in November among white troops. Comparable rates prevailed among Island Base Section troops.[45] No changes were made in procedures in Sicily before 1 February 1944.

[45] (1) Statistical Venereal Report, NATOUSA, for August 1943. (2) Statistical Venereal Report, NATOUSA, for November 1943.

Italy and the problem in Naples.—In the Italian campaign, little contact was made with the civilian population until after the capture of Naples. Civilians were largely evacuated from the area between Salerno and Naples during combat, and very few had been able to return to the area before the fall of Naples. In no area previously occupied had there been such a complete collapse of all civilian functions as in Naples. Monetary inflation was extreme, food was scarce, and a large portion of the population was unemployed. Civilian morale was at a low ebb. Women of all classes turned to prostitution as a means of support for themselves and their families (fig. 28).

FIGURE 28.—Destitute and desperate, many women in Naples turned to the streets.

Small boys, little girls, and old men solicited on every street for their sisters, mothers, and daughters and escorted prospective customers to their homes (fig. 29).

In addition to this widespread clandestine prostitution, there were in Naples an undetermined number of established brothels which had been regulated by the civilian government and had been used by the German and Italian armies (fig. 30). Regulation had largely broken down at the time of the city's fall, and many of the prostitutes had fled to the surrounding country during the Allied attack on the city. These brothels resumed operations, however, within a few days following the Allied occupation but were

FIGURE 29.—Soliciting in Naples. (From a series of posed educational photographs prepared for the Fifth U.S. Army surgeon.)

FIGURE 30.—A brothel in Naples. (From a series of educational photographs prepared for the Fifth U.S. Army surgeon.)

open to Allied troops for only a short time. During the second week in November 1943, the brothels were surveyed by a U.S. Army medical officer who selected certain of the better ones for use by U.S. troops. All others were placed off limits to U.S. personnel.

Prophylaxis stations were established in the brothels selected, and prostitutes were inspected by civilian physicians. Military police were stationed in the houses to keep order and to enforce the regulation that each man receive a prophylaxis before leaving. Each man was inspected by a Medical Department enlisted man for evidence of venereal disease upon entrance to the house and, if such evidence was found, was taken to a dispensary for examination. These houses were well patronized from their initiation, but this fact had no apparent effect upon the volume of contacts outside the brothels. A tremendous increase in venereal disease rates occurred among troops in the area during November, and a further increase occurred in December. For the first time in the history of the theater, venereal disease became a serious problem among combat troops. The rate in white combat troops of the Fifth U.S. Army rose to over 100 per 1,000 per annum in December (fig. 31.)[46] Almost all of the Fifth U.S. Army troops with venereal disease gave Naples as the source of their infection which had been acquired during their 3-day stay at the Fifth Army Rest Center in the city. A brothel was operated for Fifth Army troops a short distance from this center.

Efforts were made through the Allied Military Government to secure better civilian police control of clandestine prostitutes. Some action along these lines was taken during December, and several civilians were arrested for soliciting and given long sentences at hard labor. A noticeable decrease in the boldness of solicitation followed these arrests, but no genuine changes were brought about in the situation, and the venereal disease rates continued to rise. As a result of the high incidence of venereal disease and the threat of a typhus epidemic, Naples was put off limits on 27 December 1943 to all troops not on official business and brothels were placed off limits on 29 December. Rates in troops in both the Fifth U.S. Army and the Peninsular Base Section showed a slight drop in January, and a further decline occurred in ensuing months.[47]

Throughout 1944, Naples continued to be the source of much of the venereal disease of this theater. During the year, it was the main port and supply base of the theater. For the first half of the year, it was the only center to which men could retire for rest and diversion once they had been withdrawn from the battleline (fig. 32). It was the assembly point of the Seventh U.S. Army for the invasion of southern France.

The widespread devastation and economic distress left in the wake of the retreating German armies, superimposed on a city that had long been notorious for its widespread prostitution, produced a serious situation. The ranks

---

[46] Essential Technical Medical Data, NATOUSA, for January 1944.

[47] Statistical Venereal Reports, NATOUSA, for January, February, March, and April 1944.

FIGURE 31.—Soldiers arrive at a Fifth U.S. Army venereal disease treatment center that was established to handle the tremendous load of cases originating from the Naples area.

of the professional prostitutes were augmented by an ever-increasing number of amateurs. There was a great scarcity of food, even under Allied Military Government control. In his annual report for 1944, Brig. Gen. Joseph I. Martin, Surgeon, Fifth U.S. Army, stated:

> Food could be found in the black market, but in the breakdown or standstill in the entire economic life of Italy only the prostitute earned an income which could pay the inflationary black market price for the available food.
>
> It was not lust, but necessity, not depravity of the soul but the surge of instinct to survive which led numerous women into the ranks of the amateur prostitutes on whom regulatory legislation had little or no effect.

The Toledo district, an especially squalid neighborhood north of Via Roma in Naples, was placed off limits on 1 January 1944. This made a large number of houses of prostitution unavailable to military personnel. The military police picked up large numbers of prostitutes, and some hospitalization was furnished by the aid of the Allied Control Commission.

During most of the year, two venereal disease control officers, one regularly assigned and the other on temporary duty with the Surgeon, Peninsular

FIGURE 32.—Soldier seeking diversion and recreation in Naples. (From a series of posed educational photographs made for the Fifth U.S. Army surgeon.)

Base Section, worked in the Naples area. A very comprehensive educational program was carried on (fig. 33). Great emphasis was placed on station prophylaxis, and there was no part of the city where a soldier was many blocks from a well-equipped and effectively operated prophylactic station.

After their early experience in Naples with brothels, the off-limits policy became fairly well established and was followed as the Allied armies advanced up the boot of Italy past Rome, Leghorn, Pisa, and Florence, except in a few instances where military expediency and the shortage of military police caused several days' delay in publishing off-limits orders.

Prostitutes soon refused to work in brothels as they discovered that they could command such fantastic prices as 10, 15, or 20 dollars outside as compared to the rate of 20 to 50 lira inside the brothels. (One lira was equal to one cent.) Clandestine prostitution became a tremendous problem. While some of this was undoubtedly due to the existing adverse economic conditions, a great amount was also due to the moral standards of the Italian people. There was an almost complete breakdown in civilian law enforcement with failure to enforce existing laws against soliciting, which had been carried on flagrantly by men, women, and children.

FIGURE 33.—Comprehensive educational program in venereal disease control, Naples. A. Soldiers look at an instructional, photographic exhibit. B. Classroom for instruction in the prevention of venereal disease.

There was a large reservoir of venereal infection in the civilian population, due in part to the serious shortage of antivenereal drugs which according to Italian physicians, had existed for nearly 2 years. The history of the Fifth U.S. Army Medical Service for 1944 recorded that 60 percent of all women in Italy had some form of venereal disease, and that 95 to 100 percent of all prostitutes revealed laboratory or clinical evidence of one or more venereal diseases.

On 6 March 1944, the Regional Commissioner of Region 3 for the Allied Control Commission issued Order No. 18, designed to control prostitution in the provinces of Naples, Avellino, and Benevento. The order, in substance, stated:

1. It is unlawful for any operator or any occupant of a place of prostitution, whether or not declared to be such a place, to permit any soldier other than a soldier engaged in the performance of official duty to enter such place of prostitution.

2. It is unlawful for any female person who is afflicted with any venereal disease to have licentious connection with any soldier.

3. It is unlawful for any person in any manner to solicit or invite any soldier to have licentious connection with any female or to guide or offer to guide any soldier to any place of prostitution, whether or not the place is declared a place of prostitution.

There was never any serious effort on the part of the civil authorities to enforce this order.

Corsica.—Conditions in Corsica differed greatly from those encountered at any other place in the Mediterranean theater. Economically, Corsica had not been hurt by the war or by German occupation. The population lived mainly by agriculture and fishing. During the occupation, they received a good price for their produce. The people themselves drove the Germans out of Corsica with very little assistance from the Allies. The Corsicans, a very proud race, did not mix readily with U.S. troops and in fact seemed rather to resent their presence on the island. The U.S. force on the island was never very large. There was not sufficient level terrain to build many airfields. Consequently, the entire U.S. population, including air, medical, and service troops, was never over 15,000.

All brothels were immediately placed off limits to U.S. troops. Clandestine prostitution was at a minimum. Prophylactic stations were provided in the two larger centers of population, Ajaccio and Bastia, as well as in all unit areas.

The venereal disease rates among both white and Negro troops stationed on the island of Corsica compared favorably with those attained in the United States during the same period.

PROPHYLAXIS

Prophylaxis was considered by many to be the chief weapon against venereal disease in the North African Theater of Operations, although its value was never definitely proved. It is true that large numbers of prophylactic treatments were administered with very few reported failures. On the other hand, venereal disease rates paralleled prophylaxis rates in nearly all areas. The explanation of this phenomenon was felt to be that prophylaxis was reasonably successful but that there was a constant percentage of the men exposed to venereal disease who failed to take an effective prophylaxis, and that consequently disease rates always paralleled exposure rates. Every effort was made to provide adequate prophylactic facilities in all communities (fig. 34).

COOPERATION WITH CIVIL AUTHORITIES

No epidemiological programs of any sort were in operation in any of the Mediterranean countries. No attempt was made to discover or trace sources of infection, and this approach was entirely new to physicians and others concerned with the venereal disease problem.[48] In an effort to stimulate the development of contact-tracing activities by civilian health departments, the venereal disease contact history form was revised in April 1943 to provide space for description and identification of the contact. This form was required to be completed on all new cases of venereal disease among U.S. personnel and referred to civilian health authorities through base section headquarters. This procedure proved to be of very little practical value for several reasons. Information obtained was seldom sufficient to identify definitely the contact, and French authorities refused to take action on anything less than definite identification. Nearly all of the contacts reported were registered prostitutes who could have been readily apprehended without benefit of the report. Finally, of the few contacts who were picked up as a result of the report, practically none were diagnosed as infected because of the inadequate diagnostic methods used.

In Italy, early cooperation with civil authorities consisted of those previously described measures taken through the Allied Military Government and the Italian police to enforce existing laws against pandering and soliciting. Later attempts to improve the medical program met with little success, but an examination and treatment clinic was set up in Naples, and a few beds were set aside for hospitalization of patients with infectious syphilis (fig. 35). These facilities were small, however, and civilian medical personnel were few, were poorly trained, and required constant U.S. supervision. No noticeable effect was produced on the overall venereal disease problem by this program.

---

48 Essential Technical Medical Data, NATOUSA, for July 1943.

FIGURE 34.—An excellent, well-kept and well-operated prophylactic station at Staging Area No. 1, Naples, Italy, April 1944. A. Exterior. B. Interior.

FIGURE 35.—A civilian examination and treatment clinic in Naples, operated with U.S. Army supervision.

EDUCATION

Conditions in the North African theater made necessary an almost complete change in venereal disease educational methods and objectives from those employed in the United States. The most basic and significant change lay in the identity of the group at which the program was chiefly directed. In the United States, educational material had been designed for and directed at the soldier who was in danger of acquiring venereal disease, and education was successfully carried out because the basic truths in regard to venereal disease had been accepted by the American public and Army authorities and had been enunciated in War Department directives. In the North African theater, this was not the case, for, although the same directives existed, the theater commander was under no obligation to carry them out. It was apparent from the outset that the basic principles of venereal disease control were not understood by those in command and that policies established by War Department publications were not to be followed. This was particularly true with regard to the attitude toward prostitution and the belief that supervision and regulation was a venereal disease control measure. The attitude

also applied to other phases of the venereal disease control and treatment program, such as the staffing of prophylaxis stations and the imposition of penalties on men acquiring venereal disease. In addition to the almost universal lack of understanding of the problem among line officers, it was found that a similar state of affairs existed among many medical officers, particularly those in responsible positions.

A widespread belief existed among commanding officers that venereal disease could be prevented through the imposition of penalties on patients and their unit commanders. The publication of directives requiring court martial of individuals acquiring venereal disease was seriously considered on several occasions and was prevented only by constant vigilance on the part of the theater surgeon. In several organizations, unit commanders were penalized for high rates in their units by being denied promotions and by being given poor efficiency ratings. Such measures operated to cause concealment of venereal disease cases without materially influencing the actual incidence. The penalty idea was also frequently carried into venereal disease treatment centers where patients were denied ordinary hospital facilities and care. Strenuous work details and drill programs were organized under line officers. These procedures greatly interfered with the proper treatment and care of venereal disease cases, particularly gonorrhea, and retarded cures with a resultant increase in periods of disability.

As a result of this situation, the major venereal disease educational effort was directed toward command in an effort to obtain approval and implementation of the basic principles of venereal disease control. Data showing the inefficiency of existing policies were collected in the theater, and reports and recommendations urging adoption of scientific principles of venereal disease control were repeatedly submitted.

The same data were brought to the attention of both line officers and medical officers of all echelons through personal contact by the venereal disease control officers of major commands in the theater. The progress of this program was slow and discouraging as it entailed the destruction of perfectly sincere though unwarranted beliefs of the individuals concerned. It was, however, highly essential to the success of the venereal disease program as a whole, as no single phase of it could function properly unless those in command had a proper understanding of the basic procedures.

SUMMARY

The same basic factors contributed to the venereal disease control problem in all sections of the Mediterranean theater. These factors were an extremely high rate of infection among the civilian population, lack of any adequate civilian control programs, and the inability of command to understand the scientific principles of venereal disease control. As time progressed, the third factor was gradually eliminated, and by 1945 these principles had been officially adopted in the theater. The first two factors were never corrected,

although the Army made attempts to correct them by actually taking over civilian health department functions. The program finally developed produced some decrease in the incidence of venereal disease among troops but was never successful in bringing down rates to an altogether satisfactory level.

LEONARD A. DEWEY, M.D.

Part III. European Theater of Operations

BASIC CONCEPTS OF CONTROL

A Venereal Disease Control Branch [49] was created in the Preventive Medicine Division of the Office of the Chief Surgeon, ETOUSA (European Theater of Operations, U.S. Army), on 25 September 1942.[50] Before that time, general overall supervision of the venereal disease program, including both treatment and preventive activities, had been exercised by the Professional Services Division of the same office. On 25 September 1942, supervision of preventive and control activities passed to the newly created Venereal Disease Control Branch of the Preventive Medicine Division. Supervision of treatment was retained by the Professional Services Division throughout the life of the theater. The present discussion is limited to aspects of prevention and control of the venereal diseases.

When the Venereal Disease Control Branch was formed, a full-time venereal disease control officer was attached to the Office of the Surgeon of the Western Base Section which then contained the majority of service troops. Among the combat units which were then present, the 1st Infantry Division, the 34th Infantry Division, the 1st Armored Division, and the Headquarters, II Corps, had full- or part-time venereal disease control officers who functioned for their organizations and, to some extent, in liaison with civilian communities.

The Eighth Air Force Composite Command had a full-time venereal disease control officer who was energetically pursuing a well-rounded program including efforts to develop cooperation with the civilian authorities in Northern Ireland. None of these officers were in a position, however, to develop a comprehensive program embracing all of the necessary control activities.

At the outset of the operation of the Venereal Disease Control Branch, a protocol was drawn up to reduce to a working classification the responsibilities of the branch and the activities to which it should devote major attention. These activities were classified into the following categories: The development and coordination of educational programs for men and offi-

---

[49] The Venereal Disease Control Branch was continuously under the direction of Maj. (later Col.) Paul Padget, MC. Major Padget took over responsibility on 26 September 1942 and remained until activities ceased on 30 June 1945. Capt. (later Lt. Col.) Raymond Heitz became his principal assistant on 18 January 1943 and served continuously throughout the operations. Capt. (later Maj.) Charles P. Anderson joined the division the same day and remained for more than a year until he took up duties as venereal disease control officer in the Eastern Base Section and later in the Seine Base Section, Paris.

[50] Annual Report, Preventive Medicine Division, Office of the Chief Surgeon, ETOUSA, 1942.

cers including medical officers; planning for, and the supervision of provision of, proper prophylactic facilities and materials, both mechanical and chemical; epidemiological studies to determine the extent and location of venereal disease problems, with particular reference to causes of high venereal disease rates and the remediable factors; initiation and maintenance of cooperative relationships with other military and civilian agencies seeking the same objectives; consultation with command regarding policies and administrative procedures relating to venereal disease control; consultation on methods of diagnosis and treatment for those who become infected.

In the period of the existence of the branch as such, from the time of its original formation until the dissolution of ETOUSA, it was never found necessary materially to alter the original protocol for content. As situations developed and circumstances changed, marked alterations in the distribution of emphasis were found to be necessary, and these perhaps constitute the most significant experiences to be related.

These changing circumstances were of infinite variety and constant occurrence but, for the purpose of this narrative, may be divided into six phases: (1) The early problems in the United Kingdom when the military situation was that of creating a base of operations; (2) the later situation in the United Kingdom when, the bases being well established, major problems were created by the tremendous concentration of U.S. troops in the already overcrowded British Isles; (3) the phase of planning for and mounting the invasion of the Continent; (4) the continental phase from the beachheads to Paris; (5) the continental phase from Paris to the Rhine; and (6) the continental phase after the investiture of Germany.

The narrative will be constructed, therefore, on the plan of discussing, insofar as it is applicable, each of the items of the original operating protocol as it was developed in the successive phases.

EXPERIENCE IN THE UNITED KINGDOM

Early Problems

Educational activities.—From the very beginning, there was a serious need for educational materials which was finally resolved only long after this phase of the operation was over. An adequate number of copies of the Training Film 8–154, entitled "Sex Hygiene," was made available in the autumn of 1942, but the majority of the men had seen this film so many times during their training period that it had lost much of its effectiveness. Accordingly, requests were made for duplicate negatives of the films being displayed in the United States by the American Social Hygiene Association. Copies were made and widely displayed, and, since the films were fresh material, they were well received in spite of the fact that their appeal was directed much more toward civilians than toward a military population.

Lacking supplies from the United States, posters and other types of visual aids were developed locally. This resulted in material which was sometimes excessively crude, was usually badly reproduced since almost all of it was done on the standard mimeograph, and rarely contained a new appeal. These disadvantages were offset to some extent by the development of poster contests with prizes, usually in the form of special privileges. Where this idea was enthusiastically carried out, the publicity attendant upon the contest was frequently of more value than the resulting posters.

Both because of the circumstances and because it was the considered opinion of those responsible that it constituted the most fruitful method, the educational program depended to a large extent upon word of mouth in informal discussions. In promoting this idea, the full-time venereal disease control officers devoted their attention to discussions with medical officers and with commanding officers of the higher echelons. In the discussion with the medical officer, however, it was emphasized that a large part of his responsibility was to see to the proper education of the junior officers of the command to which he was attached, who in turn would be charged with the education of their noncommissioned officers and men. Early in 1943, the suggestion was made that the education of the rank and file of soldiers be made the responsibility primarily of the noncommissioned officers.

Courses of instruction in venereal disease control for officers were included in the officer's instruction courses at the Medical Field Service School, Shrivenham, England.[51]

Provision of proper prophylactic facilities.—Up until the end of 1942, all of the condoms available, save those which forehanded commanders had brought with their unit supply, were being procured from British sources of manufacture. These articles were totally unsatisfactory for two important reasons. In the first place, they were too small, and, secondly, they were made with a deep constriction about 3 centimeters back from the closed end—the effect being to give them a freely hanging tip to which our soldiers objected strenuously. They were, however, of good quality latex and withstood inflation tests without difficulty. By the end of 1942, condoms of American manufacture meeting standard specifications were available for purchase in the post exchanges, but free issue was not to come until later.

Up to the end of 1942, there were no supplies of the pocket chemical prophylactic kit available, but early in 1943 a small supply of V-Packettes was received. In order to utilize these to the greatest advantage, they were earmarked for issue solely to organizations of the Eighth Air Force. Almost immediately there began to appear isolated reports to the effect that the silver picrate jelly in the V-Packette was painful to the urethral mucosa, and therefore the men were tempted to avoid its use. Alternatively there were reports that the jelly was so irritating as to produce a nonspecific urethritis. These

[51] Circular No. 22, Headquarters, ETOUSA, 23 Feb. 1943, sec. II.

reports, however, were isolated, and in general the kit was well received and used as extensively as available supplies would allow.

During this phase of the operations, there was very little use made of station prophylaxis. This was in sharp contrast both to what had been seen in the training camps in the Unites States and to what was later observed on the continent of Europe. There were a number of reasons for this which probably must be taken in summation in order to afford an adequate explanation for the observed phenomenon. There was, of course, a prophylactic station as an integral part of every regular Medical Department installation. It is a matter of common experience that these prophylactic facilities are not as extensively patronized as *ad hoc* prophylactic stations set up in convenient locations outside of military installations. In the United Kingdom the small use of the prophylactic facilities in Medical Department installations continued, but there was a general and equally small use made of the *ad hoc* installations as well. A number of reasons for this were readily apparent.

In the first place, it was difficult, sometimes to the point of impossibility, to secure from the British adequate quarters in which to house a prophylactic station. There was a critical shortage of housing; all requisitions for space had to be approved by the British Ministry of Works; and, in the face of the enormous demands which were being placed upon them by the influx of U.S. troops, they were unwilling to release for use as a prophylactic station quarters which were suitable for any other purpose. In the second place, when stations were established, it was impossible to mark them in a manner to make them easy to find. British sensibilities forbade the display of prominent signs, and the rigid requirements of the total blackout forbade the use of the conventional green light. Perhaps the most important reason for the small use of station prophylaxis arose from the fact that the vast majority of the sexual exposures were wholly uncommercial and on a friendly basis. Surveys among soldiers revealed that under these circumstances they were much less impressed with the desirability or necessity of prophylaxis after exposure.

Epidemiological studies.—The original epidemiological studies were conducted on two lines. The first related to investigation of the circumstances prevailing within organizations reporting exceptional venereal disease rates. In these surveys, units with rates conspicuously lower than the average for comparable organizations were studied, as well as those whose rates were higher. From the former group, many valuable ideas were gained which were passed along for utilization where applicable. The latter were studied with particular reference to the educational status of the troops, the facilities for prophylaxis, the existence of recreational facilities, and the type of control exercised by command over the environment.

The second type of epidemiological work was based on the use of ETOUSA MD Form 302. This was developed before WD MD Form 140 and was so applicable to the particular problems encountered that it continued

in use throughout the life of the theater. Long before it was possible to make use of the contact information contained on these forms they were subjected to periodic analysis by the Medical Records Division to determine the distribution of places of exposure. With this information, studies were made of the conditions found in the civilian communities which were reported as sources of venereal infection out of proportion to their population or the number of troops stationed in the vicinity. Where possible, factual information of this type was used for discussion with local civilian authorities.

Cooperative relationships with other agencies.—During this first phase, excellent cooperative relationships were established with the appropriate officers of the British Army, the Canadian Army, the Royal Air Force, and the U.S. Navy. The closest contact and most cordial relationships were maintained with all of these agencies throughout the war, but more than an exchange of amenities was seldom required. Respects were also paid to the appropriate medical officers of the Royal Navy. Similar relationships were established with the offices and branches of the British Ministry of Health, but, with this agency, there was from the outset a closer working relationship which was necessary to carry out the prevention and control programs involving American troops in the United Kingdom.

The excellent cooperative relationships which were enjoyed with the Ministry of Health began under exceedingly happy auspices. The chief of the Preventive Medicine Division, Lt. Col. (later Col.) John E. Gordon, MC, had since 1940 been in intimate association with the British Ministry of Health, first as a civilian expert on loan from Harvard University and later as the head of the American Red Cross-Harvard University Field Hospital Unit. Through him introductions to all of the proper people were readily arranged, and the Chief Medical Officer of the Ministry of Health, Sir Wilson Jameson, proved from the outset to be interested in the venereal disease problems and was most helpful. His blessing assured easy access to local medical officers of health who, each in his own area, were virtually autonomous. The cordial relationships established with those local medical officers of health during this first phase were of incalculable value in facilitating the development of the scheme of contact investigation which came a little later.

It was readily obvious that not only would it be fruitless to attempt to establish working arrangements with the civilian police authorities, but, more importantly, such efforts might be misunderstood by the British as reflecting desire on our part to meddle in affairs which they considered strictly their own and so might occasion resentment. The fruitlessness of such an attempt arose out of the fact that the British consider sex behavior as entirely a personal matter not subject to legislation or regulation. Public opinion frowned upon brothels, so very few were known to exist. Outside of London itself, there was relatively little commercialized prostitution. Whether professional or amateur, however, so long as the woman ostensibly was acting as a free agent, and so long as a procurer or facilitator was not readily apparent, there

were no laws in the British Isles to govern her behavior providing she conducted herself in such a manner as to avoid other breach of the peace, except for one London Statute of 1828 which forbade obstruction of free passage in a public way. This was interpreted by the metropolitan police as involving the laying on of hands, so that if a professional prostitute on the streets of London actually attempted to manhandle her prospective customer, she might be brought before the magistrate in Bow Street police court or fined forty shillings, or both.

Only two other civilian agencies need be mentioned at this time, the British Social Hygiene Council and the Central Committee for Health Education. The former was essentially analogous to the American Social Hygiene Association while the latter was made up of chosen members of the former with the direct although somewhat behind-the-scene sponsorship of the Ministry of Health. It acted as a medium for the dissemination of health information with (although not so stated) especial emphasis on the venereal diseases. Cordial and cooperative relationships with both of these agencies were established from the outset, and the chief of the Venereal Disease Control Branch sat from time to time on committees of these organizations. Since their objectives were largely the development of a long-range program for the British population, little if any of their activities had immediate bearing on the problems of the U.S. Army.

Consultation with command.—From the outset, it was determined as a matter of policy that the Venereal Disease Control Branch, Preventive Medicine Division, Office of the Chief Surgeon, would insofar as practicable limit its consultations with command to the performance of staff function, courtesy calls on commanding officers when visiting posts, and consultation on specific questions when requested. It was considered much more desirable to deal in general with the senior medical officer in an organization or an installation, to make to him both general and specific recommendations—not only recommendations relating to his activities but also recommendations which he might make to command—and then to leave to him the responsibility for developing local plans in keeping with general policy but with a view to local problems. It was the consensus of all concerned that the latter policy made for better relationships between the surgeon and his commanding officer, had the advantage of avoiding the natural resistance which sometimes develops toward gratuitous suggestions from outside, and facilitated the development of more workable venereal disease control programs.

In the performance of the staff function, an unvarying policy was adopted to keep command directives concerning venereal disease control at the absolute minimum. It was considered best to rely on a few simple directives containing clear statements of basic principles and then to allow each organization to work out the details in the manner most suitable for its problems and personnel, with assistance from the central office when specific problems arose.

Consultations on methods of diagnosis and treatment.—The closest and most cordial relationship existed between the Venereal Disease Control Branch of the Preventive Medicine Division and the branches of the Professional Service Division which were charged with treatment. There was constant informal interchange of information and suggestions, and no important steps were taken by either without consultation with the other. The chief of the Venereal Disease Control Branch, however, had no formal association with the care of patients.

Later Developments

Changes in organization and administration.—With the developments which followed as a natural consequence of the increasing troop strength, a number of important changes were made in the organization and administration of the venereal disease control program.

In the earlier phase, the entire program was administered directly from the Office of the Chief Surgeon. During the second phase, which began in the spring of 1943 with the creation within the various echelons of surgeons' offices of competent staffs in preventive medicine, the administrative responsibility for the routine activities in venereal disease control was transferred largely to the respective base sections for the Communications Zone troops, to the surgeon of the Eighth Air Force (later to become U.S. Tactical Air Force Surgeon when portions of the Ninth Air Force began to arrive for the Air Force), and to the headquarters of corps and armies as they arrived.

The Venereal Disease Control Branch thus became in large measure an agency for collecting and disseminating information and coordinating the activities of the various echelons which were actually operating the venereal disease control program and also became the medium through which suggestions on general policy and procedure could be channeled to command. In one important particular, however, which will be brought out in the discussion of contact investigation, the branch retained active operational direction of what at this time was a pioneer project in the British Isles.

Intensification of education.—Early in 1943, a study was made of the educational status of troops arriving in the European theater from the continental United States. Information was sought of the adequacy of the information of the soldier concerning the general nature of venereal diseases, the method of their transmission, and the available methods for their prevention. The result of this survey indicated the necessity for intensification of the educational program in the European theater and afforded the suggestion which was transmitted informally, that there be intensification of the educational program for the troops during their training period in the United States.

Through an informal arrangement with the Surgeon of the Central Base Section, the venereal disease control officer for that base section was placed in overall charge of the educational program. He procured the services of a

professional artist who, upon designs and suggestions which had been previously approved by a board appointed for the purpose, created a series of educational posters which compared favorably with those acquired 2 years later from the United States. At the same time, the Central Base Section was made the testing ground for various types of educational approach, and, so far as the European theater was concerned, it was here first demonstrated that the venereal disease noncommissioned officer trained to lead informal small discussion groups was a powerful factor in venereal disease education.

During this period, all of the base section venereal disease control officers carried on extensive educational programs, working largely through the medium of the unit medical officer, and were made personally responsible for wide display of the available films which included the then shopworn Training Film 8–154 and the American Social Hygiene Association films entitled "In Defense of the Nation," "With These Weapons," "Health is a Victory," and "Plain Facts."

The branch in the Office of the Chief Surgeon prepared and sponsored for publication in the theater newspaper, Stars and Stripes, a series of educational and informational articles on the venereal diseases, and members of the staff of the branch lectured periodically to medical officers at the Medical Field Service School (fig. 36).

Provision of prophylactic facilities and materials.—The relatively small use of station prophylaxis continued during this period, but, even with only a small percentage of the troops who were being exposed seeking it, the troop strength was increasing so rapidly and there were so many venereal exposures that the available *ad hoc* stations came in for enough patronage to justify their existence. Relentless pressure from the U.S. Army had by this time served somewhat to wear down the British objection to granting space for this purpose, so that in the larger population centers it was possible to provide decent premises of reasonably convenient location. Also, local arrangements in many instances had gained the approval of the blackout warden for the use of a shaded and much subdued, but at the same time visible, green light as a marker at night. The most important advance in this direction was made through an agreement with the American Red Cross whereby the Army was given space for the operation of prophylactic stations on the premises of Red Cross clubs.[52] This arrangement was ideal since men on pass or furlough were virtually required to stay in Red Cross hostels because of the shortage of housing facilities among the civilian population and so found a prophylactic station right in their path when they returned to quarters after a sexual exposure.

Another important advance was made in the facilitation of widespread use of prophylactic materials by the War Department authorization for free issue of condoms and chemical prophylactic kits.[53] In developing the mech-

[52] Club Division Circular No. 187, Director, Club Operation Division, 14 July 1943, subject: Establishment of Prophylactic Stations.

[53] Circular No. 17, Headquarters, ETOUSA, 19 Feb. 1943, sec. II, Control of Venereal Diseases.

FIGURE 36.—The mother motive was used in this pair of posed photographs prepared by the Office of the Chief Surgeon, ETOUSA, for the venereal disease educational program. A. The soldier in England. B. The mother at home.

559625v—61——17

anism of this free issue, it was found impracticable to have the actual distribution done by the Medical Department. This was because of the fact that in both of the larger groups of troops, the Service Forces and Air Forces, it was not uncommon for men to be quartered at considerable distances from the Medical Department installations from which they received medical care. Under these circumstances, the soldier would seldom be near the dispensary unless reporting for sick call, and the Medical Department had no personnel to devote to the task of supervising a general distribution of prophylactic materials in barracks and dayrooms. Accordingly, the Medical Department continued procurement of prophylactic materials, but by arrangement the quartermaster accepted responsibility for storage and issue. Up until the continental invasion, storage and issue was with Class I supplies; on the Continent, it was found more practicable to store and issue with Class II and Class IV supplies. This arrangement was subject to a certain amount of criticism from outside the theater, but to those who saw it function it seemed a simple and practicable solution to a minor supply problem.

In May 1943, there was instituted a trial of sulfathiazole by mouth for the prophylaxis of gonorrhea and chancroid. The results of the first 3 months' trial in three typical Negro organizations [54] with appropriate controls were so encouraging that recommendations were made for use of the method according to the principles laid down in Circular Letter No. 146, Office of the Surgeon General, U.S. Army, 12 August 1943.

Epidemiological studies.—Both routine and special epidemiological studies were carried out in much the same manner as originally planned, with an attempt to focus attention and direct effort toward organizations with unusually high venereal disease rates and communities which were reported as providing more than their proportionate share of venereal infections (fig. 37). A special type of epidemiological study is described in the following section under the heading "Contact Investigation."

Cooperation with other military and civilian agencies.—In April 1943 under the auspices of the British Home Office, there was held a meeting which was attended by a large number of the higher dignitaries of the British Government and by representatives of the U.S. and Canadian Armies. After an extensive discussion of the problems caused by the venereal diseases both in the services and in the British civilian population, it was agreed that a committee would be formed to be known as the Joint Committee on the Venereal Diseases, which by its articles of reference was charged with making recommendations both to the services and to the British Government with regard to future policies and procedures in venereal disease control. Nothing happened until, under continuing pressure from the American side, the committee finally had a first meeting in June 1943. The chairman was Sir

---

[54] Essential Technical Medical Data, Headquarters, Services of Supply, ETOUSA, for September 1943.

FIGURE 37.—The British public house, colloquially "pub," was the soldier's club as well as the club of the common man of Britain.

Weldon Dalrymple-Champneys, Bart., of the Ministry of Health, and the members were as follows:

Brig. T. E. Osmond, RAMC	War Office
Air Commodore T. McGlurkin, RAF	Air Ministry
Lt. Col. M. H. Brown, RCAMC	Canadian Army
Col. John E. Gordon, MC	U.S. Army
Mr. T. Lindsay	Ministry of Health
Mr. T. Mathew	Home Office
Chief Constable E. A. Cole	Metropolitan Police
Dr. M. M. Goodman	Department of Health for Scotland
Mr. E. A. Hogan	Department of Health for Scotland
Mr. J. S. Munro	Scottish Home Department
Surgeon Commander D. Duncan, RN	Admiralty
Mr. H. R. Hartwell, Secretary	Ministry of Health

Eight meetings of this committee were held between 25 June and 24 September 1943, and at the last meeting there was brought in a series of 16 recommendations. The first 8 of these were specific recommendations for the development and extension of an educational program; recommendations numbers 9 through 14, inclusive, dealt in detail with a program for contact tracing; and the last 2 concerned the desirability and feasibility of routine serologic testing of certain classes of patients, especially pregnant women. Up until that time the committee had given considerable promise of accomplishment, but at the last meeting it bogged down on a discussion of prostitution and was never revived.

The cooperative relationships with the other military and civilian agencies previously named were continued.

During July and August 1943, Dr. Moore, representing the Subcommittee on Venereal Diseases of the National Research Council, of which he was chairman, and, upon invitation from the British Ministry of Health and the theater surgeon, made an extensive tour of the British Isles with particular reference to the interrelationships between the military and civilian venereal disease problems. This visit was the subject of two reports: one of these was confidential to the theater surgeon with copies to the Secretary of War and The Surgeon General,[55] and the other, which was more widely circulated, was to the Committee on Medical Research, Office of Scientific Research and Development. As a result of the visit by Dr. Moore, the British and Americans were better able to appreciate each other's problems and, with better understanding, were able to develop and carry out improved mutually supporting programs for the control of venereal disease in the United Kingdom.

At the time of arrival of the first U.S. soldiers in the British Isles, the only venereal disease control measure practiced among the civilian population was the attempt to provide conveniently located free-treatment facilities. Discreet little advertisements announcing the location of these treatment facilities were posted in public latrines, but there was no other educational program. There was no reporting of the venereal diseases either by clinics or by private physicians. Moreover, at that time under the provisions of the 1916 Venereal Disease Act, the patient was guaranteed privacy and secrecy to the extent that even to imply that he might have a venereal disease constituted libel. This, of course, rendered any type of epidemiological work and contact tracing impossible because no infected person could afford to risk an action for libel by giving the name of one with whom he had had sexual contact and who therefore might have a venereal disease.[56]

In the autumn of 1942, however, under pressure from the Ministry of Health for an amplification of the existing methods of venereal disease con-

[55] Memorandum, Lt. Col. Thomas B. Turner for The Surgeon General, 6 Sept. 1943, subject: Report of Dr. J. E. Moore on Venereal Disease Control in E.T.O., with enclosure thereto.

[56] (1) Final Report of the Commissioners, Royal Commission on Venereal Diseases. London: His Majesty's Stationery Office, 1916. (2) May, Otto: The Prevention of Venereal Disease. London: Oxford University Press, 1918, p. 146.

trol, the Privy Council drew up and eventually approved a regulation under the Defense of the Realm Act, known as Defense Regulation 33B, which became operative in November 1942.

Under the provisions of this regulation, a patient with a venereal disease was given an opportunity to name if he chose, after having been warned that there were severe penalties for false information, the individual he would identify as "the source of infection." This information was transmitted by the physician receiving it to the local medical officer of health of the place of residence of the named individual. The medical officer of health, if satisfied that the information was valid and that it had been given in good faith, held it for file and, if he received a second notification concerning the same individual, was empowered by the provisions of the regulation to serve upon this source of infection certain legal documents requiring the individual to submit to examination and treatment if necessary.

Numerous other legal documents were involved in making final disposition of the case, but from the standpoint of the Medical Department the important thing was that here for the first time was a mechanism whereby an individual with a venereal disease could legally give the name of sexual contacts, even though legally he did have to contend that one particular individual was the source of infection.

A review of the records showed that, insofar as information given by U.S. soldiers was concerned, there would be very few actions taken under the strict provisions of Regulation 33B because it was relatively unusual for one woman to be named twice with sufficient identifying particulars to make operative the legal provisions of the regulation. As has frequently been experienced elsewhere, many promiscuous women were named by more than one soldier, but, more commonly than not, only by partial name or partial address, whereas under the letter of the regulation complete names and address were required before action could be taken. It was therefore apparent that we could expect little from the operation of the letter of the regulation by the British authorities.

This being the case, authority was gained from the chief surgeon to utilize a staff of Army nurses as contact investigators and, with the concurrence of Sir Wilson Jameson, the medical officers of health of six counties in East Anglia were approached for the purpose of securing their concurrence in the operation of the scheme.

Briefly, the scheme was that the nurse would interview the soldier with a venereal disease, would gain from him as much information as she could by skillful and tactful questioning regarding the identity of his venereal contacts, and then would attempt to identify these women. If identification could be accomplished, the women were to be tactfully approached and informed that the medical findings on a friend who was a U.S. soldier suggested that the woman herself might be in need of medical examination which could be obtained from a private physician or at a designated clinic.

In the beginning, there were many who were dubious that the scheme could be made to work, primarily because of fear that the women would take offense at being approached at all on so delicate a matter and particularly at being approached by a U.S. Army nurse who, for reasons of theater policy, was required to remain in uniform. However, of the original group of medical officers of health approached, only one officer refused to give support to the proposal, and this individual capitulated soon after the scheme began to operate successfully in neighboring counties.

Fortunately, the fears were entirely unfounded. Of the first group of nearly 500 women approached, only 1 took offense, and there seemed to be reasonably good evidence that she was a professional prostitute. Four percent of the group took no offense but nevertheless did not accept the suggestion to submit to examination. More than 76 percent of those identified followed the suggestion that they report to a clinic or private physician. The efficiency which the previously existing system had exhibited in controlling the venereal diseases was brought out by the fact that, of the entire group, only 15 percent had applied for medical care before the visit from the U.S. Army nurse. The remaining 5 percent were found in jails or other institutions.[57]

The success which attended the operation of this scheme made a great impression on the British health officials and, as a matter of fact, induced them in many areas to attempt something of the sort on their own initiative. The happy effect which this had on Anglo-American relationships was more than offset during this same period by recruiting reports which reached the British concerning the number of soldiers with venereal disease who were disembarking in their ports to mix with and infect their people. This had been duly reported,[58] but it continued to such an extent that it finally became diplomatic issue and occasioned, on the 24th of February 1944, a letter from Mr. John G. Winant, U.S. Ambassador to the Court of St. James's, to General George C. Marshall.

Consultation with command.—Efforts to have published a 1943 version of General Pershing's famous General Orders No. 77, Headquarters, American Expeditionary Forces, dated 18 December 1917, which clearly define the responsibility of the unit commander in venereal disease control, resulted in the publication on 31 December 1943 of a letter addressed to each unit commander in the European theater from Maj. Gen. (later Lt. Gen.) Jacob L. Devers, then commanding. This letter contained the following passages: "* * * Contraction of venereal disease is considered evidence of improper indoctrination of the individual which is an indication of poor leadership on the part of the unit commander. * * * The responsibility for proper schooling in preventive measures lies with the unit commander; it is inalienable from

---

57 Gordon, J. E.: Control of Venereal Diseases—an Epidemiological Approach. Lancet 2: 711–715, 2 Dec. 1944.

58 Letter, Brig. Gen. Paul R. Hawley to The Surgeon General, 23 Apr. 43, subject: Syphilis Registers.

command. It is essential that commanding officers devote their personal attention to the control of venereal disease. * * * The percentage of physically fit soldiers in a command is strong evidence of the efficiency of the commanding officer."

Planning and Mounting the Continental Invasion

Separation of functions.—During the phase of planning and mounting the invasion of the Continent, the activities concerning the venereal disease control program within the United Kingdom were largely turned over to the base sections for operational management, most of the groundwork having been accomplished by this time. With the great increase in the troop strength (fig. 38), and the crowding which it inevitably produced, the problems of liaison with the British civilian authorities became increasingly important and were accordingly given a large portion of the effort of the Venereal Disease Control Branch.

Educational programs for men, officers, and medical officers.—The branch continued routinely to contribute material for stories in Stars and Stripes and its weekly feature magazine, War Week. On 27 April 1944,

FIGURE 38.—The American soldier finds Britain to his liking.

there was published material designed for the basis of an informal talk between company-grade officers and their men in the marshalling areas just before invasion,[59] and this was later made the basis of stories in Stars and Stripes, War Week, and Army Talks. Otherwise, aside from continuing to participate in the teaching activities of the Medical Field Service School, virtually all of the remainder of the educational activities were operated by the base sections, armies, and the Air Forces.

Provision of prophylactic facilities.—By the spring of 1944, there was an adequate distribution of prophylactic stations all over the British Isles, the majority of the extracantonment installations being in the Red Cross hostels. These were never widely patronized, but they were used enough to justify their existence.

By this time, also, the supply of condoms had been stabilized to the point of allowing an issue at the rate of six per man per month and also of providing for sale in the post exchanges for those who cared to purchase. The rate of sale tended to fluctuate slightly but commonly averaged about 1.7 per man per month. The supply of chemical prophylactic kits was still irregular and, since these items were shipped with a low priority, the supply position remained totally unpredictable. Late in 1943, the Eighth Air Force had conducted some clinical trials of a one-tube prophylactic kit which had been prepared for them in England according to a formula of sulfathiazole, 15 percent, calomel, 33 percent, and lanette wax base to make 10 grams. The clinical trials conducted with the small numbers of this item available occasioned a request to the Office of the Surgeon General for a supply of a similar item in a more suitable base which at the time was under clinical trial in the United States. This request was granted. The item was placed on procurement, but unfortunately it was given the same number as the old tube item; consequently, it is impossible to determine when it first reached the theater.

Epidemiological studies.—The general epidemiological studies continued, and it was found that certain of these studies, particularly the consolidated analysis of place of exposure, could be done more easily in the central office and handled there as a unit rather than by the individual base sections. Consequently, this was one activity which was not delegated. For the same reasons, the central branch continued to do special epidemiological studies where these were indicated.

Cooperation with other agencies.—During this period, the number of troops in the United Kingdom was so great that it was deemed necessary and desirable to extend the scope of the contact investigation program until finally eight nurses were engaged in this activity. They worked, however, under the direction of base sections, although they maintained the closest liaison with the central office. During this same period, at the suggestion of the Ministry

---

[59] Letter, Headquarters, ETOUSA, to Commanding Generals, American Component, Allied Expeditionary Air Force; First U.S. Army Group; U.S. Strategic Air Forces in Europe; Each Army; Base Sections; and Headquarters Commandant, ETOUSA, 27 Apr. 1944, subject: Briefing in Marshalling Areas, enclosure 2 thereto.

of Health, numerous local medical officers of health, influenced to some extent, no doubt, by the fact that the skies had not fallen when the U.S. authorities had started contact investigation, had organized teams of their own, working on an informal basis without waiting for the second notification required by the letter of Regulation 33B. These activities were of great assistance to U.S. nurses in their work, and the success of the entire scheme is reflected in the low venereal disease rate which was attained in the theater over this period.[60]

The other cooperative activities were continued without significant change.

Consultation with command.—As a part of the routine job of mounting the continental operation, the directives regarding the prevention and control of the venereal diseases were gathered together and clarified for the benefit of the forward echelon and the advance section of the Communications Zone. While this was being done, it became apparent that it would be desirable to gather material covered in several directives into one compact directive and also to reinforce certain points of existing regulations. Accordingly, there was published on 2 May 1944 Circular No. 49, Headquarters, ETOUSA, which covered all of the command aspects of the prevention and control of the venereal diseases. It is to be noted that in the 15 months of the existence of the theater after the publication of this directive it was not found necessary to amend or alter it.

In anticipation of problems which would be encountered on the Continent, this directive contained the following paragraph:

> The practice of prostitution is contrary to the best principles of public health and harmful to the health, morale, and efficiency of troops. No member of this command will, directly or indirectly, condone prostitution, aid in or condone the establishment or maintenance of brothels, bordellos, or similar establishments, or in any way supervise prostitutes in the practice of their profession or examine them for the purposes of licensure or certification. Every member of this command will use all available measures to repress prostitution in areas in which troops of the command are quartered or through which they may pass.

A broader and more general order was published by Supreme Headquarters, Allied Expeditionary Force, on 24 May 1944.

Consultation on methods of diagnosis and treatment.—The increasing frequency of the diagnosis of nonspecific urethritis was disturbing and gave rise to the fear that this was being used as a subterfuge to evade making a diagnosis of gonorrhea. Consequently, on 10 March 1944, the Office of the Chief Surgeon, Headquarters, ETOUSA, published Circular Letter No. 31 concerning the diagnosis and reporting of the venereal diseases which set down criteria permitting a clinical diagnosis of gonorrhea and purposely made any other diagnosis in the case of acute urethritis so difficult as to discourage evasive diagnoses unless there was good clinical or epidemiological evidence upon which to base doubt of a diagnosis of gonorrhea. It was

[60] Annual Report, Preventive Medicine Division, Headquarters, ETOUSA, 1944.

559625°—61——18

recognized that this would lead to an occasional erroneous diagnosis of gonorrhea, but, with the removal of penalties for the venereal diseases, it was felt that the injustice occasioned by this error would be more than offset by the better management of the patient.

EXPERIENCE ON THE CONTINENT

The Continental Beachheads to Paris

Changes in organization, administration, and emphasis.—With the invasion of the Continent, the complexity of the venereal disease control problem was greatly increased. For many months after D-day the operation of bases, the provision of facilities for hospitalization, the staging of troops, and the operations of the Eighth Air Force called for such a troop concentration in the United Kingdom that the extent of the venereal disease problems there remained essentially unchanged. Shortly after the transfer of the headquarters of the European theater to the Continent and with the formation of the United Kingdom Base, the Venereal Disease Control Branch of General Hawley's Preventive Medicine Division transferred the responsibility for the program in the United Kingdom to the Venereal Disease Control Branch, Preventive Medicine Division, Office of the Surgeon, United Kingdom Base, which continued the operations with few modifications of the original protocol.

The main activities in venereal disease control from this time on lay in the development of a program which was suitable to the differing conditions which were encountered on the Continent (fig. 39). As was noted above, it was not found necessary at this time to make major alterations in the protocol under which venereal disease control was set up and maintained in the United Kingdom, but the marked differences in the problems encountered necessitated a revision of the distribution of emphasis.

In the United Kingdom, conditions were such that the major emphasis of the extracantonment venereal disease control program was properly and most fruitfully directed toward contact investigation and to closely allied epidemiological methods. There, also, with the virtual absence of openly organized prostitution, and with British law and custom diligently respecting the rights and privileges of the individual, no attack on the venereal diseases through repression of prostitution was possible. On the Continent, quite a different situation prevailed.

Prostitution and its problems.—Prostitution was recognized and accepted as a part of the social structure; in contrast, epidemiological studies were not so fruitful as they had been previously. It was obvious, therefore, that a determined program for the repression of prostitution was the method best calculated to minimize the incidence of venereal infection. In areas where this was done as it was done consistently in areas under the control of the Advance Section of the Communications Zone, the troops enjoyed a low

FIGURE 39.—France welcomes America.

venereal disease rate. In areas where it was not done, the venereal disease rates were a direct measure of the degree to which prostitution was tolerated, condoned, or encouraged.

Obviously, it was impracticable for the headquarters group to initiate and carry out the development of a long-range program during the first month after D-day. The education of troops and the provision of prophylactic materials had been taken care of during the period of training and of mounting the operation, and at this point "on-the-spot" activities had to be left to those who were there. On 6 July, however, the chief of the Preventive Medicine Division paid a visit to France.

There he found, in Cherbourg, houses of prostitution being run for, and indirectly by, U.S. troops, with the familiar pattern of the designation of one brothel for Negro troops and the others for white, with military police stationed at the doors to keep order in the queues which formed. This is exactly what had been anticipated and was the specific reason for the incorporation in Circular No. 49 of the paragraph quoted previously. In a consultation with Col. Charles H. Beasely, MC, Surgeon, Advance Section, Communications Zone, the undesirability of this procedure was made readily

apparent, and proper consultation with command succeeded in having these brothels effectively placed off limits.[61]

During the remainder of the summer of 1944, almost the only control methods applicable were the provision of prophylactic facilities and the utilization of the off-limits authority. During the first months of the continental operations, all towns were placed off limits as a matter of general policy, with the principle of the prevention of the venereal diseases only of secondary consideration. As the supply lines lengthened, as Cherbourg became more and more important as a port, and as larger cities, such as Le Mans and Rennes, were captured and developed into supply centers with complements of static troops, a more selective use of the off-limits authority was developed. There was no unanimity of opinion, however, as to how it should be used or, for that matter, as to the attitude which should be adopted with regard to prostitution.

The history of venereal disease control problems in France had been largely one of differences of opinion between those who favored segregation and licensure of prostitution and those who opposed it. Unfortunately, because of the nature of the subject, it had never been possible to gain a free and open discussion; it was generally accounted that, since the War Department policy was clearly stated and specifically directed repression of prostitution, it was necessary to give apparent support to such a policy, even while acting contrarily.

The contrary was done in many instances in spite of the clear directive contained in Circular No. 49.

Prophylaxis.—During this period, the most reliable estimates indicated that there was on the average much less venereal exposure than had been taking place among the same group of troops in the United Kingdom. There were at least three readily discernible reasons for this. Early in the campaign, large numbers of civilians, especially those of the camp-follower type, had either fled before or had been carried with the retreating German Armies. The circumstances of active military operations reduced both the opportunity and inclination for sexual exposure. Finally, the language difficulty interposed a very real barrier during this phase.

In spite of these factors making for a reduction in the amount of venereal disease exposure and the observations that this was the case, the use of station prophylaxis increased tremendously among troops in France as contrasted to the experience of the same troops in the United Kingdom. It was relatively easy to provide the facilities for this by virtue of the fact that the enemy in garrisoning the towns which the Allies were taking had without exception built and equipped an adequate number of well-located prophylactic

---

61 (1) Annual Report, Preventive Medicine Division, Office of the Chief Surgeon, ETOUSA, 1944. (2) It is to be noted that Cherbourg was not under the command of the Advance Section at the time these brothels were being operated in this fashion. The area passed to the Command of Advance Section the day after this recorded conversation, and placing the brothels off limits was one of the first command functions exercised.

stations. These were equipped according to standards identical with U.S. Army standards, and, aside from the occasional difficulty of providing running water because the local water supply had been disrupted, they were usually ready for immediate use.

Epidemiological studies.—At this time, epidemiological studies were continued but on quite an elementary basis, since the military situation precluded the gathering of much accurate information. As static troops were moved in for the operation of the supply line, the same type of routine epidemiological studies which had been made in the United Kingdom were organized.

Cooperation with other agencies.—In the process of cooperation with other agencies, a new element which had not been previously encountered was introduced—the War Department G-5 (civil affairs) branch of the Army. This agency sometimes created extraordinary complications, since apparently there was no overall policy or procedure concerning venereal disease control in the organization and there were virtually as many different policies as there were civil affairs detachments in operation. Just as was true in command, these ranged all the way from an enlightened attitude toward the role of prostitution in the spread of the venereal diseases to a firm conviction that the operation of brothels was a duty which the Army owed to the individual soldier.

Where civilian governments continued to exist, they were at this time exceedingly willing to be cooperative but, in general, were unable to do anything for the U.S. Army or their own population that the U.S. Army itself could not do. With regard to the repression of prostitution, many of the French thought U.S. Army officials were mildly mad, but their temper at that time was to assist these officials to do anything that they wished.

Consultation with command.—During this period, consultation was limited almost entirely to a discussion of the desirability or undesirability of operating GI brothels. In some instances, the effort was made to educate officers who believed that the Army should operate brothels for the benefit of the soldiers, but it was soon learned that such educational efforts were largely futile. Apparently, a belief in the desirability of licensed prostitution is not subject to logical analysis or discussion [62] but, instead, is based on the sort of faith that leads a small boy to believe that if he places a horsehair in a bottle of water it will turn into a snake.

From Paris to the Rhine

Changes in the situation.—In the liberation of Paris in the last days of August 1944, the general picture again changed (fig. 40). For obvious reasons, Paris quickly became the center of operations for U.S. Army activities on the Continent, the number of troops stationed there rapidly increased,

62 Padget, P.: U.S. Army Experiences in Venereal Disease Control in the European Theater of Operations. Am. J. Syph. 29: 352–360, 1945.

FIGURE 40.—The liberated takes her liberator down a dark street.

the city became the natural objective of every soldier on pass or furlough, and countless numbers of soldiers, in groups all the way from one or two to entire convoys, "got lost" on their way from hither to yon and wound up in Paris for a bit of sightseeing. The German occupation had done nothing to improve the morals and behavior of the Parisian women of the brothels and boulevards, and the lack of food and, later, of fuel gave the U.S. soldier with a K ration an unbeatable bargaining position.

The immediate result was the beginning of a rapid rise in the venereal disease rate, an increase which did not level off until the rate had approximately doubled. Here again the previously employed methods of control were placed into operation, but, again, it was necessary to rearrange the emphasis. In the first place, it was necessary to consider the problem of prostitution all over again with the command of the Paris area. For example, on 2 September 1944, the provost marshal of the newly formed Seine Base Section (Paris and vicinity), stating that he was acting at the direction of the commanding general, made a tour of Paris brothels accompanied by a representative of the Brigade Mondaine for the express purpose of selecting certain houses of prostitution to be set aside for officers, others for white enlisted men, and still others for Negro enlisted men.

Education.—During this period, the educational program again had to be largely developed locally because of the difficulty of getting the necessary transportation priority for bringing in supplies. Helpful and newsworthy stories were published by Stars and Stripes, and, as base sections developed on the Continent and venereal disease control officers were assigned thereto, the program of word-of-mouth education was continued.

Prophylaxis.—With the liberation of Paris, the demand for prophylactic facilities in that city became enormous and was well supplied under the auspices of the venereal disease control officer of the Seine Base Section. Elsewhere in the larger cities as they were occupied, the policy was continued of attempting to acquire space for prophylactic stations in the American Red Cross hostels. This was not quite so successfully accomplished as in the United Kingdom, but a number of such installations were made and successfully operated. During this period, adequate supplies of individual prophylactic materials, both chemical and mechanical, were available.

Epidemiological studies and cooperation with other agencies.—Even before the liberation of Paris, it had been possible to get routine epidemiological studies under way in the areas in which the troops were static. Shortly after the U.S. Army reached Paris, through the cooperation of the Ministry of Health of the De Gaulle Government, it was possible greatly to extend these studies, and they soon approximated in scope and detail the well-organized scheme which had been conducted in the British Isles. Not the least important of these was a weekly analysis of the place of exposure which, during the latter part of 1944, consistently showed Paris to supply a large fraction—sometimes as much as two-thirds—of all the venereal infections acquired in France.

Contact investigation was already under way in Cherbourg at the time headquarters was established in Paris and was soon extended to include all of the areas in which large numbers of static troops were located. Contact investigation was not as successful in France as it had been in England, primarily because the language difficulty in France handicapped the soldier in his attempt to give accurate identifying information concerning his venereal contact (fig. 41). With the extensive cooperation of the French health authorities and, through them, the French police, an exceedingly worthwhile contribution was made toward the reduction of the venereal disease problem.

In this regard, there is one point which is worthy of emphasis. It was standard policy and procedure to regard the activities of the Medical Department in venereal disease control as strictly related to medical and public health activities, reserving the policing aspects of venereal disease control to the military police on the one hand and to civilian police on the other. Certain individuals, from time to time, departed from this, but the policy itself was unvarying and was generally accepted and applied. This had two important effects, both of which may seem at this range to involve legal hair-

FIGURE 41.—Language difficulties were not insurmountable barriers to the soldier in France.

splitting, but both of which were, at the times and places in which they were applied, of crucial importance in avoiding the creation of unpleasant incidents between the U.S. Army and the civilian population.

The first one was that epidemiological information concerning a civilian venereal contact was invariably transmitted by U.S. Army officials to the appropriate health agency. The Medical Department knew, of course, that local custom in most instances resulted in that information being handed forthwith to the police without intermediate action on the part of the health officials, but nevertheless the Medical Department's dealings were entirely with the health agency.

The second point was that on the many occasions on which U.S. Army military police accompanied the civilian police either on raids or in apprehending civilian women, they went along for the real purpose of protecting the civilian police in the event there happened to be any U.S. soldiers about who resented the apprehension of the civilian women.

Since U.S. Army officials were alone in their particular sphere of influence at this point, there was very little opportunity for cooperating with other military agencies. Occasionally, however, the opportunity presented itself in France for the continuation of the close and cordial relationships

which had been experienced in the United Kingdom. Formal exchange of courtesies with the appropriate officers of the French Army was effected in every instance in an atmosphere of extreme good will. This relationship with the French was, at the end of the year, reviewed in the following words: [63]

Not the least helpful of the present activities is the cooperation which has been gained from the French Ministry of Health. M. Cavaillon, who is the Chief Medical Officer of the Ministry, has long been interested in the venereal diseases and was not only willing, but positively eager, to offer us any cooperation which was possible in venereal disease control. He realizes the crucial importance of the venereal diseases to French public health and also is keenly aware of the undesirability of legalized prostitution. There have been many meetings with M. Cavaillon, the first on 31 August. The most important meeting, however, was on 8 September, when he was presented with a letter from the Chief Surgeon for transmittal to the acting Minister of Health, requesting cooperation of the French in excluding our troops from brothels. This eventuated on 15 September in a letter from Minister of the Interior to all Prefects of Police in France, informing brothel keepers that they must exclude American military personnel from their premises on penalty of having the brothel closed for violation. The French have made a serious effort to implement this regulation, but unfortunately in many areas, the local American commander has been unable, or unwilling, to assist in the policing problem involved. The French quite understandably refuse to attempt the policing of U.S. soldiers without help from our military police, so the brothels flourish.

The lack of consistency reflected here has led the French Health Authorities to the belief that we are mildly confused in reconciling the established policy with actual procedure. The Chief Medical Officer of the Ministry of Health was quite uncomplimentary in the comments that he made concerning a report to him from the Medical Officer of the Department of the Meuse concerning the operation of brothels in Commercy and elsewhere by the United States Army.

On the strictly medical level, however, there has been worked out a cooperative scheme between ourselves, the Ministry of Health and local health authorities, from which is being built an effective control system, based primarily on contact tracing. At the present time this is being somewhat impeded, on the one hand by the difficulty of getting reliable identifying information from American soldiers regarding their French contacts, and on the other by the lack of personnel on the part of both ourselves and the French civilian authorities to do the field epidemiologic work. Increasing familiarity with language and place names is serving to ameliorate the former difficulty and as the year ends there is some hope that a temporary loan of nurses from UNRRA may relieve the problem of personnel.

With the liberation of Belgium, in general the same policies and procedures were practiced as had been developed for France. The Belgians proved themselves to be most cooperative, and in Liége, which was the only one of the large cities in the U.S. Army's zone of influence and which late in 1944 and early in 1945 became the hub of the supply system for the front, the cooperative relationship between U.S. Army officials and civilians was excellent. An Essential Technical Medical Data report from Headquarters, ETOUSA, for the month of March 1945, dated 16 May 1945, contained the following:

On 28 March 1945, there began at the Hospital Recollets in Liége, the final step in a complete venereal disease program for that community and our troops stationed there.

---

[63] See footnote 61(1), p. 244.

Since November there has been a well organized and efficiently functioning veneral disease program, including a contact tracing scheme which has worked out in cooperation between ourselves and the civilian authorities. It has been handicapped, however, by the lack of adequate treatment for the women found to be infected. Because of the unique situation in Liége and particularly the high degree of cooperation which has been given by the civilian authorities, authority has been granted to utilize 400 ampules of penicillin a month in the treatment of selected civilian women. The protocol of the procedure is attached * * *. This protocol and the circulars to which it refers, have been translated into French and Flemish for the benefit of the various staffs of hospitals and the first patients have been treated.

The protocol referred to provided that penicillin would be used for no other purpose than for the treatment of women known or reasonably suspected of having been sex contacts of U.S. soldiers with a venereal disease, except when such women were found to have late syphilis. The treatment was directly under the supervision of an officer and nurse of the Medical Department of the U.S. Army, and carefully drawn criteria for diagnosis and determination of cure were supplied.

During this period, the consultations with command were limited almost entirely to efforts to break up the still existing habits of many commanding officers of punishing noncommissioned officers for acquiring a venereal disease by reducing them to the ranks. This is exemplified by the publication by the Commanding General, Headquarters Command, ETOUSA, of a directive creating an efficiency board to review the case of any noncommissioned officer who acquired a venereal disease with accompanying memorandum to the members of the board making it clear that the commanding general expected every noncommissioned officer brought before this board for having had a venereal disease to be reduced to the ranks for inefficiency.

The Continental Phase After the Investiture of Germany

After the invasion of Germany, two new problems of crucial importance were encountered. Both of these had been anticipated, but for neither had satisfactory plans been made. The first of these was the problem created by displaced persons. These persons had been encountered before the actual invasion of Germany took place but were found in increasing numbers as the armies pushed deeper into Germany and released the camps of slave labor.

The social and economic problems which these people presented were terrifying. The circumstances under which they had been living were such as to leave them with virtually no sense of moral responsibility. Promiscuity was the rule rather than the exception, and the incidence of the venereal diseases among them must have been high, although there was no reliable information on this subject.

The second of the problems was that caused by the nonfraternization policy (fig. 42). This problem was discussed in the annual report of Maj. Gen. Paul R. Hawley's Preventive Medicine Division for the first half of 1945, as follows:

FIGURE 42.—American soldiers at a resort in Germany take a dim although not disinterested view of the nonfraternization policy.

In anticipation of the special problems which would arise with the cessation of hostilities, the effort was made to obtain clarification of policy with regard to the venereal diseases acquired in enemy countries. As early as November 1944, a decision was requested regarding the advisability of application for prophylaxis or for treatment for venereal disease being considered as prima facie evidence of fraternization with the enemy. No clear statement of policy was obtained, so that with the occupation of Germany, especially after the cessation of hostilities, there was lack of uniform policy. Some commanders attempted to establish a program, but others went so far as to refuse to establish prophylactic stations on the assumption that to do so would be encouraging fraternization. In some organizations, men were tried before a summary court-martial, and fined the usual $65, simply for reporting with a venereal disease.

A letter order on 11 June 1945 from Headquarters, ETOUSA, concerning policy on relations between Allied occupying forces and inhabitants of Germany, clarified the situation. A portion of this letter order follows:

2. The contraction of venereal disease or the facts concerning prophylactic treatment will not be used, directly or indirectly, as evidence of fraternization or as evidence of violation by the individual of the policy on nonfraternization with the inhabitants of Germany.

With the slowing down of the armies and the final cessation of hostilities, the supply problem became very much better, and, at long last in the late spring of 1945, a series of shipments of venereal disease posters totaling 70,000 was received from the United States. This represented the first poster material received for distribution in the European Theater of Operations proper, although, some time before the date of the receipt of this material on the Continent, similar supplies had been received in the United Kingdom Base. Copies of the educational films entitled "Pick-up" and "For Your Information" also were made available during this period.

The cessation of hostilities (fig. 43) was followed immediately by a sharp

FIGURE 43.—Lovely companions made beach lounging a "must" for combat soldiers who were lucky enough to visit the Riviera Recreational Area during the last stages of the war and thereafter.

upward trend in the incidence of the venereal diseases. Unfortunately, this skyrocketing venereal disease rate was accompanied by such a kaleidoscopic shifting in the makeup of the commands in the theater and by so complete a redistribution of responsibility that during this period very little which was effective in organized venereal disease control could be accomplished.

Another minor misfortune occurred at this time in the withdrawal from issue of the V-Packette and the substitution therefor of the one-tube prophy-

lactic kit of which adequate supplies were not available. This created a critical supply problem for what was already a critical period in the venereal disease experience of the theater, and there was much speculation as to whether or not this limitation of prophylactic supplies materially contributed to the increasing venereal disease rate.

Before this period the issue of condoms had been cut from 6 per man per month for issue and an average of 1.7 per man per month for sale through the post exchanges, to a total supply of 4 per man per month for both issue and sales purposes. This otherwise undesirable move had been necessitated by directions from the Office of the Surgeon General based on the supply problem.

Efforts were made to continue epidemiological studies, but, with the cessation of hostilities and the tremendous amount of troop movement which developed immediately thereafter, these studies proved to be of less value than at any time during the life of the theater.

Cooperative relationships which had been developed with other agencies were maintained, and during this period a beginning was made toward the development of a venereal disease control program applicable to the people of Germany for the protection of the army of occupation.

PREVALENCE AND INCIDENCE OF THE VENEREAL DISEASES

Review of theater rates.—It remains to assess the conditions that existed and the methods that were used in the control of the venereal diseases in terms of the amount of venereal infection experienced by troops of the U.S. Army and to examine the distributions of the several diseases among various elements of the U.S. forces in Europe. The total venereal disease rate will be used as the index.

The initial phase of operations in Europe has been defined as the period dating from the arrival of troops in February 1942 through the mounting of Operation TORCH at the end of 1942. During the first months after the establishment of the theater, the rates for the venereal diseases were decidedly good, as would be anticipated for troops newly arrived in a strange country with much to do in becoming established in a new environment and in building a military structure. For the first 8 months of 1942, the rates for troops in the European theater were better than those for the United States despite long experience in many wars indicating that higher rates almost invariably occur among troops away from home. For a good part of this time, the theater rates were half those of troops in the Zone of Interior.

As greater acquaintance developed with the United Kingdom, and as the first flush of other interests in a new country subsided, the rates for the venereal diseases began to increase. This was first noticeable in August and progressed continuously through December to reach a rate of 58 per 1,000 per year which was never again duplicated until the troops reached France.

The experience of the early months of the second phase of operations in the United Kingdom was characterized by a more or less fixed incidence of the venereal diseases at a level slightly in excess of 50 per 1,000 per year, after which a steady, downward trend took place in the frequency with which these diseases were noted. This downward trend continued until D-day and the invasion of Normandy. The annual rate for 1943 was 43, compared with that of 26 for troops in the United States.

The decidedly low level to which rates for the venereal diseases had declined in 1944 was one indication of the seriousness with which U.S. soldiers undertook the obligation of preparing for the invasion and of the hard work that went into it. For a number of months just before D-day, the rates for theater troops were actually better than those for troops in the continental United States. The increase just before D-day was much less than had been anticipated as a result of the frequently expressed "last fling" attitude.

Normandy became the business of the day, and troops engaged in the assault on the Continent had such an excellent record with respect to venereal diseases that the rates for the entire theater were carried with it; venereal disease in the Army dropped to a level of 20 per 1,000 per year, a truly excellent record of itself and one which essentially matched that of the early days of the theater but unfortunately was never to be attained again.

The average rates for the venereal diseases among troops of the U.S. Army stationed on the European Continent were never as good as those which marked their stay in the United Kingdom. It was appreciated in advance that they would not be. A rate of 25 per 1,000 per year had been set as the criterion of satisfactory control in the United Kingdom. Based on the same standards of a reasonably attainable goal, a rate of 50 was taken as a satisfactory basis upon which to judge European performance.

The rates became greater as continental operations were extended. The effect of the transfer of theater headquarters and of general activities to Paris was evident when the rates for October touched 58. A moderate improvement was noted in the next succeeding months, and, indeed, the curve of incidence acquired a fastigium as it had in England once conditions became more or less stabilized.

The approaching end of the war and the contact with new people and new conditions led to a decided rise in rates in March and April. When V–E Day finally arrived, the inevitable letdown took place, and the rates for venereal diseases soared. In May, the rates were greater than in April, and June saw the highest rate in the history of the theater, with every indication that the end was not yet and that army of occupation would have an experience with those communicable diseases greatly exceeding that of the period of wartime operations (fig. 44).

Rates in the major forces.—The average long-term incidence of the venereal diseases in the United Kingdom was maintained at a satisfactory level. Nevertheless, the three principal forces constituting the command, the Ground

FIGURE 44.—Athletic activities were fostered as a form of substitutive activity, Garmisch-Partenkirchen, Germany, June 1945.

Forces, the Air Forces, and SOS (the Services of Supply) showed certain variations in the frequency with which these diseases occurred. The year 1943 is taken in illustration of experience in Great Britain, and the period September 1944 to June 1945, for continental operations (tables 19 and 20). Troops of the Ground Forces regularly and consistently had the best record in the United Kingdom. There was not much to choose between the experience of the Services of Supply and that of the Air Forces, but, in general, the highest rates for any of the three groups were among troops of the Air Forces, the only troops then actively engaged in combat. Much the same relationship was maintained during operations on the Continent, although no doubt existed then that Communications Zone troops outdistanced all others.

The Air Forces continued a very close second. The best rates by far were those of the Ground Forces, although in the final week of the theater, the week ending 29 June 1945, the Ground Forces, came into their own and led all three forces with a rate for the week of 140 per 1,000 per year.

TABLE 19.—*Incidence rates for venereal disease, all forms, in the U.S. Army in Great Britain, 1 January 1943 to 30 June 1944*

[Rates expressed as number of cases per annum per 1,000 average strength, by weeks]

Week ending—	Ground Forces	Air Forces	Services of Supply	Week ending—	Ground Forces	Air Forces	Services of Supply
1943				*1943*—Con.			
Jan. 1	47	75	71	Oct. 1	22	35	40
8	47	63	65	8	26	(1)	(1)
15	46	42	68	15	23	34	31
22	37	45	46	22	18	37	32
29	17	59	88	29	8	35	34
Feb. 5	34	49	52	Nov. 5	9	35	23
12	(1)	(1)	(1)	12	16	29	30
19	83	76	62	19	11	28	35
26	53	64	58	26	17	28	30
Mar. 5	(1)	(1)	(1)	Dec. 3	18	23	28
12	60	58	50	10	13	29	31
19	42	50	57	17	22	30	27
26	44	70	39	24	13	26	23
Apr. 2	22	57	50	31	20	22	26
9	37	72	49				
16	51	53	59	*1944*			
23	42	60	50	Jan. 7	14	23	20
30	30	58	40	14	16	33	19
May 7	32	35	35	21	15	31	30
14	48	57	40	28	16	29	31
21	36	47	63	Feb. 4	15	23	24
28	31	34	44	11	16	26	21
June 4	35	34	37	18	16	28	24
11	20	43	42	25	15	27	23
18	27	31	33	Mar. 3	17	21	20
25	50	33	30	10	13	23	15
July 2	(1)	(1)	(1)	17	16	27	21
9	24	36	36	24	15	23	28
16	27	44	33	31	17	28	24
23	43	39	29	Apr. 7	18	29	20
30	35	39	38	14	16	33	23
Aug. 6	21	29	29	21	14	31	23
13	20	40	35	28	13	28	18
20	21	36	37	May 5	11	28	14
27	10	43	41	12	14	30	19
Sept. 3	21	33	33	19	14	33	15
10	10	37	45	26	17	29	23
17	26	33	40	June 2	13	33	18
24	27	32	43	9	19	32	20
				16	22	31	20
				23	19	31	17
				30	12	38	19

[1] No data available.

Source: Division of Medical Records, Office of the Chief Surgeon, ETOUSA.

TABLE 20.—*Incidence rates for venereal disease, all forms, in the U.S. Army, by major commands in continental Europe, 1 September 1944 to 29 June 1945*

[Rate expressed as number of cases per 1,000 average strength per annum, by weeks]

Week ending—	Ground Forces	Air Forces	Communications Zone	Ground Forces Replacement Command	Week ending—	Ground Forces	Air Forces	Communications Zone	Ground Forces Replacement Command
1944					*1945*—Con.				
Sept. 1	4	------	15	------	26	17	73	92	67
8	10	------	15	------	Feb. 2	16	69	81	72
15	17	------	27	------	9	19	68	79	95
22	27	102	45	------	16	22	76	81	75
29	28	120	76	------	23	21	61	73	88
Oct. 6	24	95	78	------	Mar. 2	18	60	66	75
13	26	103	88	73	9	18	66	67	82
20	26	111	93	98	16	22	72	79	67
27	27	101	90	80	23	22	74	80	74
Nov. 3	21	77	96	46	30	22	65	80	90
10	23	89	86	42	Apr. 6	18	62	62	68
17	22	87	78	48	13	19	70	71	76
24	23	75	85	66	20	18	64	80	72
Dec. 1	20	81	83	67	27	29	68	72	99
8	24	82	91	93	May 4	31	56	69	76
15	27	99	88	90	11	42	69	70	76
22	24	78	89	74	18	53	89	91	79
29	21	70	74	68	25	68	74	92	75
					June 1	70	75	82	104
1945					8	86	94	96	128
Jan. 5	19	58	76	61	15	91	100	94	143
12	20	69	92	50	22	93	107	117	155
19	20	68	93	56	29	140	120	107	153

The Ground Forces Replacement Command, a continental organization, had decidedly high rates for the venereal diseases throughout the course of operations. Comparison with the Ground Forces themselves is striking. If the entire period of continental operations is considered, the ranking position of the Communications Zone remained safe, but the Ground Forces Replacement Center displayed a burst of speed at the end that outdistanced all others. The venereal disease rate for that organization during the week ending June 1945 was 153 per 1,000 per year.

The Services of Supply and the Communications Zone.—Three large base sections, the Western Base Section, the Eastern Base Section, and the Southern Base Section, a smaller Central Base Section which included the metropolitan district of London, and the North Ireland Base Section which was somewhat isolated and of lesser troop strength, comprised the organization of the Services of Supply in Great Britain.

Over the course of the many months in the United Kingdom, the Western Base Section had the poorest record of the several base sections (table 21).

TABLE 21.—*Incidence rates for venereal disease, all forms, U.S. Army Base Sections, SOS, in United Kingdom, 1 January 1943 to 30 June 1944*

[Rates expressed as number of cases per annum per 1,000 average strength, by weeks]

Week ending—	Central Base Section	Eastern Base Section	Southern Base Section	Western Base Section
1943				
Jan. 1	------	68	50	107
8	------	45	71	97
15	------	73	68	88
22	------	36	53	67
29	------	60	125	110
Feb. 5	------	71	33	57
12	------	(1)	(1)	(1)
19	------	75	71	54
26	------	79	21	102
Mar. 5	------	(1)	(1)	(1)
12	------	51	19	92
19	------	52	58	85
26	------	43	21	69
Apr. 2	------	39	53	73
9	------	54	50	49
16	------	40	44	118
23	------	53	38	67
30	------	58	36	33
May 7	15	21	30	79
14	0	34	49	58
21	15	66	73	62
28	29	52	48	33
June 4	56	40	32	42
11	41	54	29	45
18	66	39	34	21
25	22	21	33	57
July 2	(1)	(1)	(1)	(1)
9	20	42	37	34
16	9	44	20	52
23	18	19	31	46
30	53	58	16	36
Aug. 6	32	41	26	19
13	23	42	26	43
20	22	34	45	47
27	0	29	46	78
Sept. 3	0	30	29	63
10	34	37	36	67
17	7	48	14	79
24	20	36	41	69

Week ending—	Central Base Section	Eastern Base Section	Southern Base Section	Western Base Section	North Ireland Base Section
1943—Con.					
Oct. 1	6	47	27	63	(1)
8	(1)	(1)	(1)	(1)	(1)
15	0	27	23	61	(1)
22	6	46	22	43	15
29	15	32	29	52	28
Nov. 5	20	27	12	36	33
12	10	31	15	55	7
19	32	55	16	50	11
26	4	31	26	78	17
Dec. 3	9	28	16	42	89
10	18	36	14	55	24
17	4	24	19	50	21
24	15	37	17	24	29
31	10	24	19	48	11
1944					
Jan. 7	13	27	16	30	0
14	20	14	9	34	23
21	6	27	29	44	15
28	9	46	17	41	61
Feb. 4	18	26	21	31	24
11	11	31	15	32	11
18	26	30	19	32	4
25	14	23	17	39	10
Mar. 3	6	30	17	19	33
10	5	21	10	20	21
17	8	31	15	27	21
24	13	35	29	28	33
31	17	47	22	20	19
Apr. 7	41	27	18	18	13
14	5	31	29	19	17
21	13	17	21	29	27
28	25	41	15	16	6
May 5	5	7	14	14	24
12	10	------	16	27	13
19	5	------	10	23	13
26	13	------	35	17	22
June 2	13	------	15	24	32
9	12	------	27	15	10
16	18	------	14	29	(1)
23	21	------	14	23	(1)
30	7	------	15	30	(1)

[1] No data available.

Source: Division of Medical Records, Office of the Chief Surgeon, ETOUSA.

The rates in the Eastern Base Section were always relatively high. The best long-term record of the three principal sections went to the Southern Base Section, considering troop strength and the concentration of activities in that region. Particularly favorable comment is directed to the Central Base Section in London, with a first-class record achieved under difficult circumstances. The program of control was under competent direction and had the active support of command. The North Ireland Base Section had a consistently good performance.

There was not much to choose among the various sections of the Communications Zone in France. The rates for all sections were higher than the theater average, and the Seine Base Section in Paris maintained leadership with no difficulty until it yielded precedence to the Delta Base Section as that organization came into the European theater in November 1944 (table 22). No single major organization of the theater ever approached the rates that organization had in the Marseilles region.

TABLE 22.—*Incidence rates for venereal disease, all forms, U.S. Army Base Sections of the Communications Zone in continental Europe, 1 September 1944 to 29 June 1945*

[Rates expressed as number of cases per annum per 1,000 average strength, by weeks]

Week ending—	Advance Base Section	Continental Advance Base Section	Brittany Base Section	Channel Base Section	Delta Base Section	Normandy Base Section	Loire Base Section	Oise Base Section	Seine Base Section
1944									
Sept. 1	12	-------	10	-------	-------	16	(1)	-------	(1)
8	11	-------	22	-------	-------	14	28	-------	11
15	26	-------	22	(1)	-------	27	36	-------	83
22	67	-------	36	-------	-------	21	51	-------	98
29	110	-------	28	63	-------	46	72	-------	128
Oct. 6	96	-------	96	119	-------	40	10	264	94
13	125	-------	82	117	-------	28	222	82	164
20	122	-------	129	155	-------	35	50	96	186
27	98	-------	76	124	-------	52	135	252	134
Nov. 3	98	-------	86	144	-------	49	98	250	151
10	80	-------	91	136	-------	42	120	153	153
17	67	-------	101	88	-------	48	63	176	115
24	86	(2)	125	89	(2)	40	100	148	121
Dec. 1	66	-------	88	111	-------	47	(3)	131	146
8	99	-------	105	87	-------	59	-------	140	136
15	79	63	118	87	178	54	-------	93	128
22	79	73	114	80	165	50	-------	100	136
29	55	29	100	66	139	62	-------	93	98
1945									
Jan. 5	58	16	81	91	179	46	-------	82	88
12	72	33	128	87	179	47	-------	106	133
19	91	62	127	80	169	54	-------	92	115
26	66	50	146	92	167	61	-------	105	115

See footnotes at end of table.

TABLE 22.—*Incidence rates for venereal disease, all forms, U.S. Army Base Sections of the Communications Zone in continental Europe, 1 September 1944 to 29 June 1945*—Con.

Week ending—	Advance Base Section	Continental Advance Base Section	Brittany Base Section	Channel Base Section	Delta Base Section	Normandy Base Section	Loire Base Section	Oise Base Section	Seine Base Section
1945—Con.									
Feb. 2	52	66	96	77	180	56	-------	72	128
9	45	56	98	86	133	76	-------	93	122
16	48	66	(3)	88	153	79	-------	81	101
23	45	57	-------	87	137	65	-------	83	93
Mar. 2	37	49	-------	83	100	60	-------	99	78
9	36	42	-------	82	110	70	-------	70	106
16	43	33	-------	118	155	80	-------	80	92
23	50	69	-------	94	159	74	-------	81	95
30	45	74	-------	111	143	85	-------	69	66
Apr. 6	39	46	-------	83	96	63	-------	52	89
13	38	42	-------	66	101	83	-------	65	94
20	46	65	-------	77	96	96	-------	76	111
27	50	60	-------	73	105	76	-------	66	99
May 4	47	39	-------	66	125	72	-------	69	90
11	48	31	-------	87	102	75	-------	65	93
18	50	30	-------	120	128	101	-------	87	145
25	49	81	-------	96	121	93	-------	104	109
June 1	46	50	-------	63	105	99	-------	83	118
8	65	72	-------	109	130	104	-------	94	81
15	57	79	-------	94	140	68	-------	82	109
22	63	69	-------	96	167	103	-------	112	119
29	80	67	-------	101	137	102	-------	119	105

[1] Activated.
[2] Assigned Communications Zone, ETO.
[3] Inactivated.

Source: Division of Medical Records, Office of the Chief Surgeon, ETOUSA.

Rates in the Air Forces.—The Eighth Air Force remained continuously in Great Britain and the rates for the venereal diseases quoted for Air Forces in Great Britain are essentially those of the Eighth Air Force. The Ninth Air Force operated on the Continent, and continental Air Force troops were principally of that command (table 23).

Venereal diseases among men of the Ninth Air Force were more frequent than for those of the Eighth Air Force; but the differences were not great, and the spread was by no means comparable to that for Communications Zone troops under the two conditions.

TABLE 23.—*Incidence rates for venereal disease, all forms, U.S. Army Air Forces, 1 September 1944 to 29 June 1945*

[Rates expressed as number of cases per annum per 1,000 average strength, by weeks]

Week ending—	Continental Europe	United Kingdom	Week ending—	Continental Europe	United Kingdom
1944			*1945*—Continued		
Sept. 1	--------	52	Feb. 2	69	34
8	--------	51	9	68	38
15	--------	55	16	76	45
22	102	57	23	61	47
29	120	54	Mar. 2	60	35
Oct. 6	95	62	9	66	42
13	103	71	16	72	55
20	111	78	23	74	58
27	101	61	30	65	61
Nov. 3	77	56	Apr. 6	62	50
10	89	83	13	70	29
17	87	59	20	64	55
24	75	62	27	68	58
Dec. 1	81	46	May 4	56	62
8	82	48	11	69	57
15	99	54	18	89	72
22	78	56	25	74	64
29	70	59	June 1	75	47
			8	94	49
1945			15	100	60
Jan. 5	58	44	22	107	63
12	69	54	29	120	58
19	68	55			
26	73	54			

Source: Division of Medical Records, Office of the Chief Surgeon, ETOUSA.

Rates in the field armies.—Until completion of active operations in May 1945, the venereal disease rates for field armies were consistently the best of all troops of the theater, so much so that there was scant comparison. Differences among the five armies constituting the Ground Forces are difficult to demonstrate (table 24). Sometimes one army had the best record for a month or so, sometimes another. The behavior of all was characterized by a sharp rise as the war ended, with no question remaining of where the explanation lay for the greatly increased rates of the theater as a whole, which characterized the final weeks.

Rates during active operations.—Venereal diseases were very definitely more frequent among troops serving on the Continent than among those in

TABLE 24.—*Incidence rates for venereal disease, all forms, U.S. armies in continental Europe, 1 September 1944 to 29 June 1945*

[Rates expressed as number of cases per annum per 1,000 average strength, by weeks]

Week ending—	First U.S. Army	Third U.S. Army	Seventh U.S. Army	Ninth U.S. Army	Week ending—	First U.S. Army	Third U.S. Army	Seventh U.S. Army	Ninth U.S. Army	Fifteenth U.S. Army
1944					*1945*—Con.					
Sept. 1	1	7	------	------	Feb. 2	20	12	12	17	------
8	12	9	------	[1] 7	9	29	14	16	17	------
15	28	14	------	4	16	30	15	16	26	------
22	35	21	------	11	23	27	17	16	25	------
29	30	33	------	4	Mar. 2	20	18	16	18	[1] 4
Oct. 6	23	33	------	11	9	23	16	16	18	7
13	27	34	------	9	16	26	15	18	23	26
20	30	30	------	10	23	30	13	19	22	20
27	27	32	------	14	30	21	16	18	29	17
Nov. 3	26	25	------	13	Apr. 6	19	10	18	18	26
10	26	30	------	15	13	18	10	20	23	26
17	24	23	------	17	20	17	11	13	24	26
24	26	20	[1] 23	18	27	35	15	33	34	31
Dec. 1	20	16	20	23	May 4	37	17	24	34	42
8	26	18	20	22	11	50	24	39	46	55
15	22	20	20	29	18	(2)	35	44	60	74
22	26	21	14	24	25	------	40	70	77	93
29	18	14	23	21	June 1	------	48	64	78	101
					8	------	56	89	110	94
1945					15	------	84	102	92	75
Jan. 5	20	16	15	14	22	------	84	101	(2)	96
12	29	15	13	15	29	------	126	162	------	113
19	28	17	15	16						
26	26	14	10	17						

[1] First report received.

[2] Redeployed.

Source: Division of Medical Records, Office of the Chief Surgeon, ETOUSA.

the United Kingdom Base. The commonly expressed belief that the greater rates for the theater during the time of active operations were completely an expression of the forces serving on the Continent was not wholly true, for the venereal diseases were more common in both localities. The rate for the period September 1944 to June 1945, inclusive, in the United Kingdom was 47 per annum per 1,000 average strength compared with 35 for the year 1944; and the frequency of these conditions among troops on the Continent for the September 1944–June 1945 period was no more than 59 per annum per

1,000 average strength. The general increase was a function of both commands (table 25).

TABLE 25.—*Venereal disease, all forms, in the U.S. Army, in the United Kingdom and on the Continent, by month, September 1944 to June 1945*

[Rate expressed as number of cases per annum per 1,000 average strength]

Month and year	Total		United Kingdom		Continent	
	Cases	Rate	Cases	Rate	Cases	Rate
1944						
September	5, 695	35	2, 673	40	3, 022	31
October	7, 876	57	2, 203	53	5, 673	59
November	7, 311	48	1, 935	48	5, 376	48
December	11, 223	50	2, 379	40	8, 844	53
1945						
January	9, 472	48	1, 968	39	7, 504	52
February	9, 284	45	1, 797	38	7, 487	47
March	12, 747	48	2, 454	48	10, 293	48
April	9, 985	46	1, 780	46	8, 205	46
May	13, 705	62	1, 856	62	11, 849	62
June	27, 705	105	[1] 3, 048	66	[1] 24, 657	113
Total	115, 003	56	22, 093	47	92, 910	59

[1] Data are only estimated.

Differences in rates in white and Negro troops.—The usual difference between venereal diseases among white and Negro populations was consistently observed among troops of the U.S. Army serving in Europe. The rates for both groups were higher on the Continent than in the United Kingdom, but the relative difference remained almost identical, about 1 to 4.5 (table 26).

Types of venereal disease.—The distribution of the venereal diseases according to clinical form, grouped as syphilis, gonorrhea and those other than syphilis and gonorrhea, is presented in table 27, for each of the 4 years of the existence of the European theater. Gonorrhea constituted the great bulk of infections; the rates for syphilis remained fairly similar throughout the years except for a rather well marked increase in 1943, when the proportion of syphilis to other forms of venereal disease was increased. The rise in rates for the group classed as other venereal diseases and noted in 1945 was distinctly related to the troops arriving in the European theater from Italy,

where the incidence of chancroid was measurably great. The monthly reports of syphilis show a uniform distribution throughout each year. The high incidence in 1943 is shown to be particularly a function of the latter part of that period (table 28). Similar data are presented for gonorrhea in table 29.

TABLE 26.—*Venereal disease, all forms, in the U.S. Army, European theater, Negro and white, by month, February 1944 to June 1945*

[Rate expressed as number of cases per annum per 1,000 average strength]

Month and year	Total		White		Negro	
	Cases	Rate	Cases	Rate	Cases	Rate
1944						
February	2, 115	30. 1	1, 426	22. 0	689	127. 3
March	2, 590	25. 1	1, 775	18. 6	815	106. 4
April	2, 451	26. 4	1, 707	19. 9	744	102. 9
May	2, 291	22. 8	1, 632	17. 6	659	82. 5
June	2, 993	23. 5	2, 137	18. 1	856	83. 3
July	2, 371	21. 8	1, 753	17. 3	618	83. 1
August	2, 594	20. 4	1, 906	16. 3	688	69. 0
September	5, 695	34. 8	4, 282	28. 3	1, 413	113. 5
October	7, 876	56. 6	5, 469	42. 8	2, 407	212. 1
November	7, 311	48. 0	5, 027	35. 9	2, 284	182. 4
December	11, 223	49. 5	7, 764	37. 2	3, 459	190. 8
1945						
January	9, 472	48. 3	6, 179	34. 5	3, 293	196. 2
February	9, 284	45. 1	6, 290	33. 3	2, 994	173. 3
March	12, 747	48. 2	8, 842	36. 4	3, 905	179. 3
April	9, 985	45. 6	7, 221	35. 9	2, 764	154. 6
May	13, 705	61. 8	10, 432	51. 9	3, 273	177. 6
June	27, 705	105. 2	20, 463	84. 9	7, 242	324. 4
Total	132, 408	47. 6	94, 305	36. 9	38, 103	169. 4

TABLE 27.—*Incidence of venereal disease in the U.S. Army, European theater, by clinical form and year, February 1942 to June 1945*

[Rate expressed as number of cases per annum per 1,000 average strength]

Disease	Total		1942		1943		1944		1945	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Syphilis	21, 929	6. 9	420	5. 8	2, 798	10. 6	8, 269	5. 6	10, 442	7. 6
Gonorrhea	119, 780	37. 7	2, 196	30. 2	7, 945	30. 1	41, 824	28. 4	67, 815	49. 5
Other	6, 886	2. 2	119	1. 7	601	2. 3	1, 525	1. 0	4, 641	3. 4
Total	148, 595	46. 8	2, 735	37. 7	11, 344	43. 0	51, 618	35. 0	82, 898	60. 5

TABLE 28.—*Incidence of syphilis in the U.S. Army, European theater, by month, February 1942 to June 1945*

[Rate expressed as number of cases per annum per 1,000 average strength]

Month	Total		1942		1943		1944		1945	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
January	2,067	7.7	--------	0	112	10.2	567	9.2	1,388	7.1
February	2,096	7.4	1	3.2	50	5.9	606	8.6	1,439	7.0
March	2,714	7.2	3	3.8	32	3.9	738	7.1	1,941	7.3
April	2,230	6.9	2	2.3	105	9.9	687	7.4	1,436	6.6
May	2,390	7.2	9	4.2	104	11.0	613	6.1	1,664	7.5
June	3,308	8.1	8	2.3	86	7.1	640	5.0	2,574	9.8
July	706	5.3	28	4.4	220	11.5	458	4.2	--------	0
August	796	5.1	59	6.7	295	15.2	442	3.5	--------	0
September	1,034	5.2	47	3.7	337	14.4	650	4.0	--------	0
October	1,245	6.5	107	6.4	401	10.9	737	5.3	--------	0
November	1,317	6.4	96	8.6	395	9.6	826	5.4	--------	0
December	2,026	6.7	60	6.4	661	10.2	1,305	5.8	--------	0
Total	21,929	6.9	420	5.8	2,798	10.6	8,269	5.6	10,442	7.6

Comparison with other theaters of operation.—Comparison of the rates for the venereal diseases among troops of the European theater with those of U.S. troops serving in the United States shows the experience of the theater to be commendable (table 30). The rates were greater, but rates are always greater among troops serving in a foreign country. Compared with the experience of the British Army serving at home, the rates for U.S. troops in Great Britain were measurably higher.

TABLE 29.—*Incidence of gonorrhea in the U.S. Army, European theater, by month, February 1942 to June 1945*

[Rate expressed as number of cases per annum per 1,000 average strength]

Month	Total		1942		1943		1944		1945	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
January	9,396	35.0	--------	0	512	46.8	1,451	23.6	7,433	37.9
February	9,067	31.8	2	6.5	410	48.5	1,428	20.3	7,227	35.1
March	12,103	32.1	11	13.9	378	45.6	1,749	16.9	9,965	37.7
April	10,260	31.7	11	12.5	460	43.5	1,646	17.7	8,143	37.2
May	13,464	40.4	29	13.6	322	34.1	1,601	15.9	11,512	52.0
June	26,195	64.5	24	6.8	335	27.6	2,301	18.1	23,535	89.3
July	2,594	19.3	103	16.1	627	32.8	1,864	17.1	--------	0
August	2,926	18.9	155	17.7	654	33.8	2,117	16.7	--------	0
September	6,128	30.7	450	35.5	730	31.3	4,948	30.2	--------	0
October	8,598	44.7	538	32.2	1,043	28.5	7,017	50.4	--------	0
November	7,820	38.2	416	37.3	1,051	25.7	6,353	41.7	--------	0
December	11,229	37.3	457	49.0	1,423	21.9	9,349	41.3	--------	0
Total	119,780	37.7	2,196	30.2	7,945	30.1	41,824	28.4	67,815	49.5

559625 —61——19

TABLE 30.—*Incidence rates for venereal disease, all forms, in the U.S. Army, by theater or area and year, January 1942 to June 1945*

[Rate expressed as number of cases per annum per 1,000 average strength]

Theater or area	All venereal diseases					Gonorrhea	Syphilis	Venereal diseases other than gonorrhea and syphilis
	1942–45	1942	1943	1944	1945	1942–45	1942–45	1942–45
Continental United States	33	39	26	33	44	26.0	4.8	1.9
Overseas:								
Mediterranean	91	35	56	111	102	54.9	12.4	23.2
Africa-Middle East	67	86	69	60	75	29.0	13.6	24.7
Latin America	54	74	58	36	27	31.7	10.1	12.1
China-Burma-India	50	64	53	51	47	22.7	11.5	15.8
Europe	47	38	43	35	61	37.7	6.9	2.2
Southwest Pacific	26	33	15	7	57	17.0	3.1	5.4
North America	12	10	10	14	18	10.0	1.5	.4
Alaska	5	7	3	5	9	3.8	.8	.1
Pacific Ocean Area	6	11	5	5	3	4.3	1.2	.3
Total overseas	44	33	34	41	57	30.4	6.6	7.2
Total Army	37	38	28	37	52	27.6	5.5	3.9

Among U.S. troops in the various theaters of operation, those in the European theater fared best by far. The highest average rate attained in any area was the overall rate of 90.5 per annum per 1,000 average strength which was attained in the Mediterranean. The rate of 67 attained in the Africa-Middle East theater was next highest, and the Latin American area rate of 54 was not far below. The overall rate of 47 for venereal disease in the European theater ranks fifth among the rates in the nine oversea areas (table 30).

PAUL PADGET, M.D.

Part IV. Other Oversea Areas and Theaters

U.S. ARMY FORCES IN THE MIDDLE EAST

Before the formation of USAFIME (U.S. Army Forces in the Middle East), it was known that U.S. Army troops in this area would be confronted with a venereal disease problem that was entirely different than that encountered in the continental United States.

The USMNA (U.S. Military North African) Mission made a study of venereal disease in Egypt and adjacent areas in the latter part of 1941. The surgeon for the mission was Maj. (later Col.) Crawford F. Sams, MC, who

reported that the question of venereal disease and prostitution in the Middle East was an enormous one—one that would cause considerable trouble in any group of troops or civilian workers coming into the area.[64]

The civilian venereal disease situation was later described as characterized by an enormously high rate, semiofficial toleration of brothels, and numerous outlawed brothels.

Not only was the venereal disease rate very high among the civilian population, but most of the cases were untreated. Statistics were incomplete, but available records at that time indicated that at least 12 percent of the population was infected. In the lower social strata, the percentage of people infected was believed to be much higher than that for the nation as a whole. A control program, consequently, would have to take into account the differences in native customs and mores.[65]

Administration and organization.—When USAFIME was originally organized on 16 June 1942, its headquarters was located at Cairo, Egypt. The theater was composed of the Eritrea, Delta, Levant, and Persian Gulf Service Commands and the U.S. Ninth Air Force. Later, the Delta Service Command was subdivided into the Delta and Libyan Service Commands, and, still later, in September 1943, the U.S. Army Forces in Central Africa were redesignated the West African Service Command of USAFIME. At the same time, the U.S. Army Forces in Liberia was incorporated into USAFIME without change of name. The Persian Gulf Service Command (Iran) was made a separate command in December of 1943, became known as the Persian Gulf Command, and existed as a separate command until July 1945 when it was again made a part of USAFIME. USAFIME, at that time, was redesignated AMET (the Africa-Middle East Theater). The control program in Iran is presented under the Persian Gulf Command.

Maj. (later Col.) Thomas G. Ward, MC, was appointed theater medical inspector by Colonel Sams, Surgeon of USAFIME. Major Ward also assumed at that time the duties of director of preventive medicine and thus became the first venereal disease control officer. In November 1942, Capt. (later Lt. Col.) Herbert S. Traenkle, MC, reported as full-time venereal disease control officer for the theater.

The various subdivisions of USAFIME had venereal disease control officers in either full- or part-time capacities. In Liberia, Lt. Col. (later Col.) Justin M. Andrews, SnC, Assistant Chief of the Preventive Medicine Branch, acted as the venereal disease control officer until Captain Faison was sent by the War Department to take over control duties in a full-time position. Sub-

---

[64] Letter, Maj. Crawford F. Sams, MC, Surgeon, USMNA Mission, to The Surgeon General, U.S. Army (through: Chief, USMNA Mission), War Department, Washington, D.C., 2 Jan. 1942, subject: Sanitary Survey Heliopolis, Egypt.

[65] Letter, Maj. William A. Brumfield, Jr., MC, to Assistant Chief of Staff, G–1, War Department, Washington, D.C. (through: The Surgeon General, U.S. Army), 2 Mar. 1943, subject: Report of Investigation of Venereal Diseases Among United States Army Forces in Central Africa, the Middle East, and India.

sequent venereal disease control officers in this area were Capt. Alfred C. Thomas, MC, and Capt. James H. Nickens, MC.

The officer in charge of venereal disease control in the Levant Service Command was Capt. (later Maj.) Thomas C. Brandon, MC, who was also the medical inspector. The organization in the Eritrea Service Command included Maj. Irving Rathgel, MC, medical inspector, and in the Libyan Service Command venereal disease control was carried on by Maj. (later Lt. Col.) Dan Crozier, MC, medical inspector.

Egypt (Delta Service Command).—In Egypt, which had been occupied by British Army Forces, a military venereal disease problem existed before the arrival of U.S. troops. The incidence rate of the venereal diseases in the British Army varied between 3.5 and 4.5 per thousand per month. Practically all this disease was acquired in Cairo or Alexandria, which men visited on leave if they were not stationed in the vicinity of these cities. The venereal diseases were classified as 30 percent gonorrhea, 30 percent soft chancroid, 10 percent syphilis, and 30 percent miscellaneous venereal diseases.[66]

The Surgeon, Delta Service Command, after surveying the area commented in his annual report for 1942 as follows:

> Venereal diseases have not been unduly alarming considering the surrounding influences. Prostitution is very common among the native population and [is] not infrequently considered an honorable profession. Treatment and control measures of venereal diseases among the lower classes are practically non-existent. Reliable statistics on the incidence are not available but it is definitely known that the population is heavily infected. This [Egypt] being a foreign and independent country the U.S. Army exercises no governmental power. It is therefore purely the responsibility of the Egyptian Government to institute and enforce such regulations as are attempted in the civilian population. During the first half of 1942, Government approved and regulated houses of prostitution were permitted. The houses were so carelessly supervised and medical examination so inadequate that none could be classed as "controlled houses." The government then saw fit to eliminate, by law, houses of prostitution. This did not improve the situation or necessarily make it worse. At times there is a half-hearted attempt by the police to enforce such laws as do exist. This was probably more for "effect" rather than a sincere effort to improve conditions. Consequently, there exists an unusually large number of "streetwalkers," "taxicab prostitutes," "undercover houses," "pimps," and other forms of [prostitution] not commonly known in the United States.

The problem in Egypt was fundamentally that of a never-decreasing supply or source of venereal contact. Prostitution was either condoned, accepted, or regulated, and sexual promiscuity was more or less general. Population differences influenced the character of social intermingling between U.S. Army troops and local civilians. There were many white and Negro soldiers in this area. The Anglo-Egyptian Sudan, which normally had had a large population of Negroid peoples, dark-complexioned Arabs, and few white persons, now harbored a considerable number of Rumanian refugees. Egypt proper had an influx of peoples from all over Europe, which changed its heretofore predominantly Arab population.

---

66 See footnote 64, p. 267.

The peoples of the Nile area now represented a higher level of culture than other peoples in the Middle East. They were more intelligent, the government was better organized, and the economic conditions were more stabilized. The white soldier was attracted by these people, and there was ample opportunity and even inducement for sexual exposures with resultant venereal disease. These facts were proved by the venereal disease rates for the months of July, August, and September 1942, which included a rate of 88 per 1,000 per annum for the Headquarters Section at Cairo and a rate of 84 per 1,000 per annum for the Delta Service Command (Egypt). For the same period, the rate for the theater as a whole was 43 per 1,000 per annum.[67]

Palestine (Levant Service Command).—This command was very small, and venereal disease was prevalent among troops stationed there, but the mean strength of the command was, at the most, insignificant when compared with the other commands. Palestine never presented a problem from the standpoint of venereal disease. However, because of the government's attitude toward prostitution, it was difficult for Army authorities to launch any kind of antiprostitution program. The existence of prostitution was not officially recognized in Palestine. The British succeeded in having so-called gynecological clinics established ostensibly for the treatment of all diseases of the female reproductive system. Actually, they were little more than clinics for the treatment of venereal diseases. These clinics were designed to reduce infectious venereal disease among the female population and thereby to reduce the risk of exposure to soldiers.

Eritrea and Anglo-Egyptian Sudan (Eritrea Service Command).—Venereal diseases among U.S. Army Forces stationed in this area did not constitute a serious problem.

Central Africa (West African Service Command).—This area comprises the countries and colonies extending from the west coast of Africa eastward through French Equatorial Africa and then southward to include the Belgian Congo and Kenya Colony. The command for the most part had representatives from all the forces including Services of Supply. Troops were dispersed into relatively small groups at airfields along the Air Transport Service ferry route, and stations at Accra represented the largest concentration of troops.

The population in this area was almost completely indigenous. The people were illiterate and primitive in dress, manners, and customs. Their homes were crude huts of thatched grass; their towns were dirty, lacking in sanitation, and generally uninviting.

There was no venereal disease problem among the white troops in this area, but a different situation was encountered with U.S. Negro soldiers. The native of this region was racially the same as the American Negro soldier, and friendships were begun from the time of the first arrival of U.S. troops. Sexual promiscuity was more or less universal among the natives. There was

---

[67] See footnote 65, p. 267.

no such thing as prostitution. Extramarital sexual relationship was the social custom, and women, before marriage, were termed "free," with no social stigma against sexual indulgences.

For the first month that Central Africa headquarters reported, September 1942, the venereal disease rate was 429.2 per 1,000 per annum. The venereal disease rate among the natives was at this time undetermined. There were no reliable data available for the civilian population of Central and West Africa. The civilian health authorities confessed that they had little interest in venereal disease, since there were so many other public health problems which to them were of greater importance. Gonorrhea and chancroid were very prevalent in the cities and less so in the rural areas.

Liberia (U.S. Army Forces in Liberia).—This area proved troublesome for the entire period during which U.S. troops were stationed here (fig. 45). The venereal disease control problem in Liberia was the headache of everyone in USAFIME. The highest rate in the theater occurred here and was never significantly lowered. Occasionally, the rate was lowered for short episodes by extensive control, but these decreases were only sporadic and the high rate prevailed throughout most of the period.

FIGURE 45.—Early preparation for the arrival of American troops in Liberia, Africa, mid-1942.

Roberts Field, the Army base where most troops were stationed, was near Monrovia, the country's capital (fig. 46). Many native villages were in close proximity to Army camps. Chancroid and gonorrhea were rampant, and there was a high percentage of syphilis. The natives were, again, all Negroid, similar to those in Central Africa (fig. 47), and had similar ideas as to sexual promiscuity. The U.S. troops in this area were nearly all Negro engineers, and there was no want of companionship. The physical attractiveness of native women was not unlike that of women the Negro soldiers were accustomed to in the United States, and, furthermore, there were no color or social barriers to their seeking companionship and sexual gratification. Within a short time after the arrival of these troops, the venereal disease rate was over 600 per 1,000 per annum.[68]

The control of venereal disease here was as important as malaria. For the months of August, September, October, and November of 1942, the venereal disease rate averaged 650 per 1,000 per annum. On 1 September 1942, a plan to control venereal disease in U.S. troops and the native popula-

FIGURE 46.—Typical street scene in a Liberian city.

[68] Annual Report, Surgeon, U.S. Army Forces in Liberia, USAFIME, 1943.

FIGURE 47.—Group portrait of Liberian girls in dancing costume and makeup. (Photograph courtesy of Dr. Justin M. Andrews.)

tion was formulated at a conference which included representatives of the Liberian Health Department, the Medical Director of the Firestone Tire and Rubber Company plantations, and U.S. Army officers. A plan was made whereby so-called tolerated women's villages were started adjacent to Army camps. A very interesting and detailed account of this procedure was written by Major Brumfield, (p. 278) who made a careful survey of the venereal disease problem in Liberia in November and December 1942. The following description is taken from his report to The Surgeon General:

* * * Out of this conference came the proposals that the Liberian Government set up villages for native women in the area contiguous to the military reservation; that women infected with venereal disease would not be permitted to live in these villages; that soldiers would be permitted to visit these villages but that passes to distant native communities would be infrequent; that effort would be made through education and recreation facilities to discourage sexual contacts between the villagers and soldiers. Although it was recognized that such a plan presented many undesirable features it was agreed upon as a distinct improvement over the then existing conditions, and as the most feasible solution in view of the natives' morals and customs.

Accordingly, two women's villages were established by the Liberian Government in an area adjacent to but not a part of the U.S. Military reservation (fig. 48). Women seeking admission to the villages were examined for venereal disease, particularly for

FIGURE 48.—Group of girls in "Bandtown." Note homes of thatched construction in background. (Photograph courtesy of Dr. Justin M. Andrews.)

evidence of venereal ulcers or vaginal discharge. If found free of demonstrable venereal disease they were photographed and tagged and permitted to enter the village. The homes of thatched construction were sold to the women at a nominal price ($15.00 for a 3-room cottage). Community sanitary facilities were taken care of by the Liberian Government (fig. 49).

The residents of the women's villages are examined weekly. Any woman showing any evidence whatsoever of infection has her tag taken up and is treated until all signs and symptoms have disappeared. The tag is then returned and she is again permitted to enter the women's village. The tags, in addition to showing that the women have been examined and found free of obvious venereal disease, serve as means of identification. Wherever it is apparent that several soldiers may have acquired infection from the same woman, she is removed from the village irrespective of the results of physical examination.

The construction of the women's villages must not be construed as the entire program of venereal disease control of Roberts Field. It is simply an attempt to cope with a very bad situation. The intensive program of morality lectures, lectures on the medical aspects of the venereal diseases, and of recreation is being vigorously pursued.

It is useless to talk about the repression of prostitution and reduction of sexual promiscuity in Liberia. These practices are deeply ingrained * * *. It is impossible to reduce the venereal disease rates in the entire population. The next best thing is to reduce the rates among a part of the population and to limit association of soldiers to this group. The women's villages have been established for this purpose.

That this program produced some result was manifested by the decrease in the rate from 715 per 1,000 per annum in November to 470 per 1,000 per annum in December 1942. The prevailing diseases were chancroid and gonorrhea, and, in an effort to try to get a higher protection rate, Captain Faison, the venereal disease control officer, compounded a single prophylaxis

FIGURE 49.—Group of girls in a "palaver" hut—community center for the village. (Photograph courtesy of Dr. Justin M. Andrews.)

ointment which consisted of mercurous chloride ointment and sulfathiazole powder, two parts ointment to one part powder by weight. Captain Faison instituted a program in which men going on pass were given 2 grams of sulfathiazole to be taken by mouth and a quantity of the ointment to be applied to their genitalia following contact. If a man returned from pass and had not used the ointment or taken the oral medication, he was given 4 grams of sulfathiazole.[69]

The control measures, as instituted by Captain Faison, were put into effect, and, in the venereal disease report for USAFIL (U.S. Army Forces in Liberia) for the 5-week period ending 29 January 1943, the rate was 470 per 1,000 per annum. Many troops still persisted in not taking any prophylaxis and the incidence rate remained high. However, of 184 men who took prophylaxis during the month, none had developed venereal disease during this period.

The station surgeon at Roberts Field in reporting the venereal disease problem in Essential Technical Medical Data summed up the situation as it appeared in November 1944:

[69] Letter, Lt. Col. Justin M. Andrews, SnC, Assistant Chief Health Officer to The Chief Health Officer, Roberts Field, Liberia, 5 Jan. 1943, subject: Venereal Disease Control Activities at Roberts Field, Liberia.

It seems that everyone, but those who contract these diseases, is cooperating in an all-out effort to put the brakes on this business. However, it continues rampant to date in spite of all that the command and the Medical Department have been able to do. It is the opinion that the venereal diseases will continue to be our number one problem and that it will tend to remain high. The closeness of the native villages, inhabited by many infected women who deliver themselves and sell their wares to soldiers almost at their door step and the increased disregard for using protective measures by the men, during or following contacts, have been almost uncontrollable factors. Many of these men have been tried by Courts Martial, recently, for being caught off-limits, but it is humanly impossible to watch every man at all times. In fact, the greatest offenders are those who should enforce law and order, the MP personnel. The widely publicized quick cure of gonorrhea by use of penicillin, and the new public law, as to pay forfeiture, have added to the venereal disease control problems in this area.

Due to the lack of civilian medical facilities in this area, it has been necessary for us to take extreme measures in our effort to control venereal disease among our troops. Almost 100 per cent of our cases are contracted by men who make contacts in "off-limits" villages, who use neither mechanical nor chemical prophylaxis, and who do not report to a station for supervised prophylactic care. With the permission of Liberian authorities, all native women within ten villages nearest the military area, where men are known to make sex contacts, are being examined by our VD control officer, and are to be treated for whatever venereal disease they may have. Treatment for syphilis will be given at a central village dispensary. Sulfathiazole is to be given, under supervision, to all men and women in these villages who have gonorrhea. These measures, though unusual and extreme, are highly advisable for this particular situation. Whatever the reasons are, in the minds of so many enlisted men who fail to utilize protective measures and who persist in making contacts with known, infected women, we can only deduct that they are flimsy ones. Frank carelessness, laziness and disregard of health and regulations are strikingly in evidence in too many instances.

Summary.—By the end of 1944 the original purpose of the USAFIME had been fulfilled. Many activities were terminated and others curtailed. The prime mission of the command at this date was to maintain Air Transport Command routes. However, the Surgeon, USAFIME, deplored the fact that the theater rate had reached a peak of 83 per 1,000 average strength per annum for the 4-week period ending on 24 November 1944. The rate for the same period for our forces in Liberia was 700.18 per 1,000 per annum. The average strength for the command was 19,885 and that for Liberia, 595.

With the beginning of 1945, no new control programs were attempted. The rate for the theater was still high with no noticeable changes. For the 4-week period ending on 23 February 1945, the average strength of the command was 20.659, of which 824 were Negro. The venereal disease rate for white troops was 56; for Negro troops, 631; and for the aggregate, 79 per 1,000 per annum. The strength of Negro troops for the command was about 4 percent, but this group raised the total venereal disease rate approximately 40 percent or 23 per 1,000 per annum. The command at this time had headquarters at Cairo with the bulk of the troops assigned to Air Transport Command posts scattered over wide isolated areas.

During the 4-week period ending on 25 May 1945, when the average strength of the command was 29,809 troops, the venereal disease rate for the

aggregate was 62. The rate for the white troops was 55 and that for the Negro troops, 278. In discussing prevailing rates, in Essential Technical Medical Data for June 1945, the theater surgeon made the following remarks:

> The incidence of venereal diseases increased from the rate of seventy-nine (79) per thousand per annum in January to ninety-one (91) per thousand per annum in April, then fell to sixty-two (62) per thousand per annum in May. Based on information from incomplete reports the rate for June will be approximately eighty-four (84) per thousand per annum. The incidence of these diseases was highest among the colored troops in Liberia. Fifty-eight (58) new cases, thirty-five (35) gonorrhea, ten (10) syphilis and thirteen (13) others, occurred among this personnel during the period, giving a rate of 1,024 per thousand per annum. These troops, comprising approximately 2 percent of the total strength of the command, contributed approximately 35 percent of this total number of venereal disease cases occurring in the theater. Educational, punitive and many other measures have failed to control effectively the venereal diseases among this group.

PERSIAN GULF COMMAND

The mission of the Persian Gulf Command was to convey supplies from the Gulf ports of Iran across the country (including a portion of Iraq) to the Caspian Sea and the Soviet border and the maintenance of highways and railroads necessary to carry out this mission.

Originally, the command consisted of a few troops scattered in small units along a thousand miles of crude highways and railroad. Rough terrain and extremes of heat and cold made communication and organization difficult. Supplies of all kinds, including medical equipment, were late in arriving.

Northern Iran and Iraq had a conglomerate population. In addition to the native white and Arab population, this area also had an influx of refugees from the German-occupied countries in Europe, and therefore this northern area possessed a large white population. Southern Iran, on the other hand, had a very small white population.

Of the towns in the north, Teheran, the capital of Iran, was the most important. Here were located the headquarters of the Persian Gulf Service Command, and also the headquarters of the U.S. Army Engineers. In the southern area, the most important towns were Ahwaz, Iran, and Basra, Iraq. These towns were more or less native, the former having a small European section.

Venereal diseases (syphilis and gonorrhea) were rife among Persians of all ages, and it was estimated that 80 percent of the population was infected. Infection was spread from urban areas to rural communities by charvadars (muleteers), native soldiers, and the nomadic habits of many of the people. Therefore, troops sent to this area were confronted with a civilian population that had a high venereal disease infection rate.

As might have been expected, the venereal disease rate among U.S. troops in this area was high—among the highest of any of the theaters where U.S. troops were stationed. Control of the excessive rate presented a difficult

problem. The high rates encountered were simply a part of a general disease picture which reflected conditions prevailing in this region.

Civilian collaboration.—Although Great Britain established a protectorate over Iran in 1940, the country, nevertheless, was an independent kingdom, and the regulation of internal affairs was left entirely to the Iranian Government.

The health service, though organized, was inadequate. Trained personnel were at a minimum, and what public health was being done was more or less government aid by hospitalization of the indigent sick. Very little had been done in the way of general or local sanitation, a problem which the Iranians felt was more important than the control of venereal disease. Therefore, in many ways, the local civil authorities were of little assistance to the Army in its venereal disease control program. Little or no cooperation was obtained from the federal or local Iranian police, whose income depended partly on what they could obtain as fines from those persons they apprehended.

Prostitution.—Prostitution in Iran was widespread and universal. It was an accepted social custom and there was no stigma attached to it. There were no segregated areas in the larger towns and cities, and the prostitutes were not registered by the police. When they were arrested, it was not because of prostitution but because of vagrancy.

Teheran, the Iranian capital, presented a serious venereal disease problem. Typical of a large city in the Middle East without an adequate venereal disease program, Teheran was teeming with prostitutes. The U.S. soldier stationed in a land that afforded little entertainment and possessing unlimited amounts of money fell easy prey to the prostitutes, many of whom were of European descent or were refugees from the occupied countries. Any real repression of prostitution in cities like Teheran, or over the entire country of Iran, would have required a change in public opinion which at that time was impossible.

Ahwaz, the city next in importance after Teheran, was more of a native city, as few Europeans lived in this area. It was impossible to describe the filth and poverty of this city. The streets for the most part were unpaved and had sewage running in the middle of them. The sewers drained into open ditches at the sides of the larger avenues. The prostitution districts of Ahwaz were most disreputable.

Control of prostitution in Iran was difficult even with the stepped-up venereal disease control activities of the Iranian Government. There was no national law against prostitution. Native travel was unrestricted. Therefore, a check on girls was all but impossible, and as fast as girls were apprehended by the civil police others appeared. The demand was great, and the source was greater.

Organization.—Cognizance of the prevalence of venereal disease in the Persian Gulf Command was taken by those in authority as early as 1942.

At the beginning, the Persian Gulf Service Command was a part of the theater known as the U.S. Army Forces in the Middle East. The theater headquarters was at Cairo, Egypt, and a plan was set up for the control of venereal disease in Iran subsequent to a survey made by Major Brumfield, who visited the area in November and December 1942.

A full-time venereal disease control officer, Captain Traenkle, was assigned to the Office of the Surgeon, USAFIME. Captain Traenkle from the beginning realized that the Persian Gulf Command presented many problems in preventive medicine and that any venereal disease control program would be a part of the whole program to protect, insure, and maintain the health of U.S. Army troops in this area.[70]

On this premise, a full-time venereal disease control officer for the Persian area, Capt. (later Maj.) Louis W. Abbamonte, MC, was assigned to the command surgeon's office with headquarters at Teheran. A similar full-time venereal disease control officer, Capt. (later Maj.) Nils B. Hersloff, MC, was appointed to the Desert (Ahwaz) District. Part-time venereal disease control officers for the other two districts, Mountain and Gulf, were appointed from the district surgeon's office. In the Persian Gulf Command, all commanding officers of units or posts within the command were responsible for a venereal disease control organization of their own to combat local problems.

Incidence and control measures.—The high rate in the Persian Gulf Command, as compared to the theater as a whole, was explained by the large majority of Negro troops, the relatively small number of white females available for contact with white troops, the lack of adequate prophylactic stations in the isolated camp areas, and boredom resulting from lack of recreational facilities.

By spring of 1943, the most difficult problems of control, unhampered prostitution and lack of proper prophylactic facilities for men who were in transit convoying supplies, were widespread. Communication and organization of command were difficult. Supplies of all kinds, including medical supplies, were still inadequate. Housing conditions, at best, were still poor in a land characterized by extremes of heat and cold. Finally, from the beginning of 1943, approximately four or five thousand new troops had arrived in the area each month, the majority of whom were Negroes.[71]

Recommendations for correcting such conditions as soon as possible were made by Captain Traenkle who surveyed the area in May 1943. He recommended that towns where no control was possible be placed off limits, that military police be increased in order to patrol towns and adjacent vicinities for the apprehension of wandering prostitutes, and finally that more instruction be provided troops in the need for correct and adequate prophylaxis as

---

[70] Letter, Capt. Herbert L. Traenkle, Venereal Disease Control Officer, to The Chief Surgeon, USAFIME, 29 May 1943, subject: Venereal Disease Control in the Persian Gulf Area.

[71] (1) Letter, Capt. Louis W. Abbamonte, MC, Venereal Disease Control Officer, to Commanding General, Headquarters, Persian Gulf Service Command, 19 July 1943, subject: Venereal Disease and Controlled Prostitution. (2) See footnote 70.

soon as possible after contact. A command bulletin from Teheran in October 1943 further outlined a comprehensive program of education and preventive measures for the control of venereal disease (fig. 50).[72]

FIGURE 50.—Sign warning soldiers of venereal disease at Camp Amirabad, Iran, November 1943.

[72] Bulletin No. 9, Headquarters, Persian Gulf Service Command, USAFIME, 19 Oct. 1943, Section I (supp.): Prevention and Control of Venereal Disease.

At the end of 1943, the rate was still exceedingly high, and the seriousness of this continued high incidence was brought to the attention of unit commanders throughout the command. In addition, certain deficiencies in prophylaxis methods were corrected. Attendants of prophylactic stations were inadequately trained to render this treatment, and facilities in many of these stations were either inadequate or being used with a faulty technique (fig. 51).

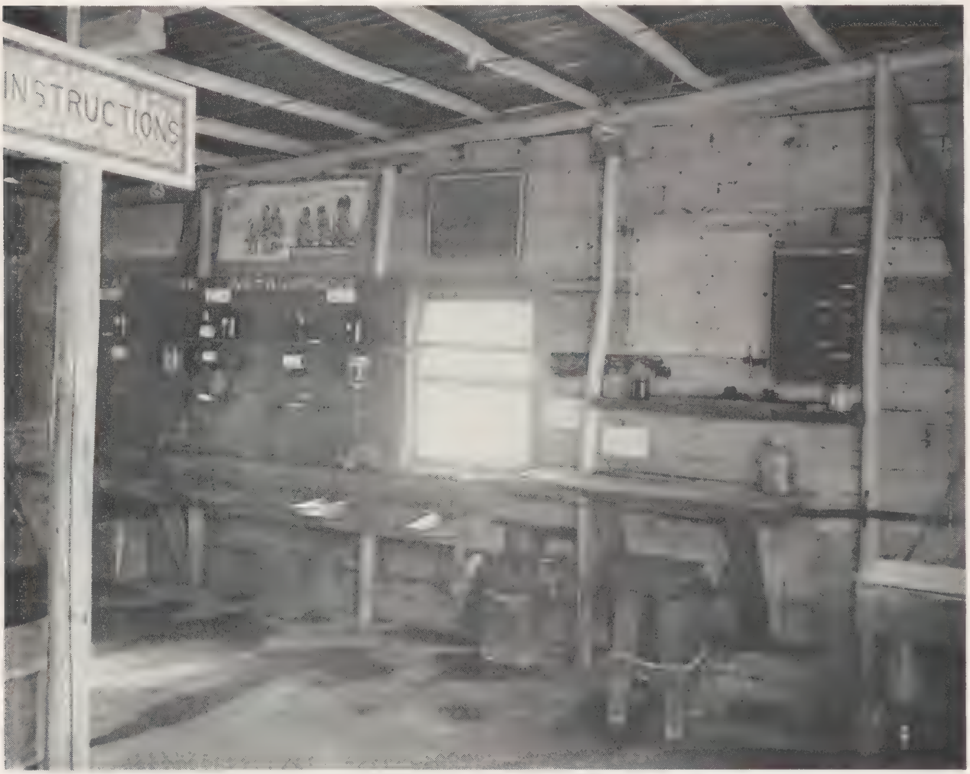


FIGURE 51.—Interior facilities of a prophylactic station at Andīmeshk, Iran.

The first 6 months of 1944 saw an excellent reduction in venereal disease rates. By July 1944, the venereal disease rate had decreased until it reached its all time low of 43 per 1,000 per annum. An analysis as to the causes of this satisfactory decrease revealed that at this time all units were performing at peak efficiency. The tonnage to the U.S.S.R. reached its maximum. Such a program required the best effort on the part of each soldier and officer. Any time remaining after a day or night of hard work could easily be spent in pleasure derived from participation in many activities planned by various services and agencies.[73]

[73] Annual Report, Surgeon, Persian Gulf Service Command, USAFIME, 1944.

This was the picture until July 1944. From then on, the overall effort slackened, and a rise in the venereal disease rate occurred. Partly responsible for this rise was the fact that certain motor transport and engineer units, made up entirely of Negro troops, had been alerted for transfer to other theaters and were staged for a prolonged period of time during which the venereal disease rate for these units markedly increased. This increased overall rate also coincided with the discontinuance of loss of pay for contracting venereal disease and with the introduction of penicillin in the treatment of gonorrhea and syphilis. Many observers in the area believed, after talking to medical officers and patients, that the average soldier's outlook on venereal disease had undergone a drastic change. "Why shouldn't we take chances?" the soldiers said, "We don't lose our pay and one can be cured of gonorrhea in one day and syphilis in one week."

The rise in the venereal disease rate only intensified the desire by those in authority to combat the menace, and, in November 1944, Headquarters, Desert District, took the drastic measure of presenting a demonstration of the ravages of venereal disease using infected native prostitutes from Andīmeshk as exhibits. These prostitutes voluntarily admitted themselves, by affidavit, to the 19th Field Hospital for treatment, observation, and exhibition. Subordinate commands were notified of the exact dates and places where the demonstration would be held for their officers and men. The complete program was in the form of a lecture-demonstration. The post commander opened each period with a talk on military aspects of venereal disease, passing on the desires of the district commander in this respect. The chaplain followed with a short talk on moral and religious aspects of bodies free from venereal disease. Then medical officers gave short but thorough talks on various venereal diseases, stressing the correct and exact use of prophylaxis. The medical officers then exhibited the native prostitutes to the personnel of the command with explanations relative to each prostitute's disease, prognosis, and health hazard to the community. Each session ended with a question-and-answer period. The immediate reaction of the men to these demonstrations was that of shock and revulsion.

The commanding general of the Persian Gulf Command was so impressed with the lecture-demonstrations as given in the Desert District that, on 14 December 1944, he directed that similar demonstrations be given in the other districts. He made the allowance, however, that when infected prostitutes could not be obtained for the purpose, the demonstration of similar lesions in the male could be substituted.

Accordingly, similar demonstrations were carried out extensively throughout the ports, the Gulf District, and the Mountain District with the use of infected males. In all cases, followup posters were designed and distributed which stressed continence and the need for early and complete prophylaxis if continence was not practiced. The effectiveness of this program was never really evaluated. For the month of January 1945, there was a slight increase

in the venereal disease rate which was believed to have been due to voluntary reporting of venereal disease by individuals who had witnessed the demonstrations and had become properly alarmed. The medical officer at Hamadan, Camp Park, reported that within 24 hours after the demonstration three soldiers voluntarily submitted themselves for treatment of unreported genital lesions. On 27 January 1945, in his report of the whole program to the Commanding General, Persian Gulf Command, the commanding officer of the ports and Gulf District commented as follows:

> * * * it should be one of the finest educational demonstrations of its kind that the majority of troops have ever had the opportunity to attend. Those to whom we have given a lasting impression to remember throughout their life-time will be better, wiser and happier men for having seen these cases. It was an opportunity for them to both hear and see the truths about venereal disease at one time, an opportunity rarely offered the average citizen-soldier.

With the March 1945 rate of 55 per 1,000 per annum, the rate showed a slight decrease until the last report of August which was 48 per 1,000 per annum. However, it was the opinion of the theater surgeon that efforts to lower the rate further were nullified by the termination of the war with Japan which caused a letdown among the troops. Control among men stationed as security details in isolated abandoned camps became increasingly difficult because of the attendant monotony and boredom of this type of duty.[74]

Summary.—The overall picture of the venereal disease control program in the Persian Gulf Command was one of moderate success. Characterized at the onset by an excessive rate of 116 per 1,000 per annum, it gradually declined until by the summer of 1945 the rate had reached a more or less steady plateau of about 55 per 1,000 per annum. This command had a large proportion of Negro supply troops who contributed over 80 percent of the venereal disease incidence rate. The Negro rate was also gradually lowered from a high of 482 in March 1943 until the summer of 1944 when it had leveled off to around 150. In the winter of 1944–45 and the spring of 1945, Negro rates again became excessive (361) until they reached the level of the rates for the spring of 1942.

THE PACIFIC AND THE ASIATIC MAINLAND[75]

Hawaii[76]

The venereal disease rate for the Hawaiian Department in 1941 was 14.1. During 1942, it declined to 9.6. During the first 5 months of 1942, control

[74] Essential Technical Medical Data, Persian Gulf Service Command, for August 1945.

[75] The history of venereal disease control activities in the Pacific and on the Asiatic mainland, except in the Philippines, is based primarily on material which has been summarized from reports written by officers in charge of venereal disease control activities in the areas concerned. When the authors were known, they have been given full credit. However, some of these reports were included in overall theater histories, and individual authors were unidentifiable. In such instances, the theater history has been credited.

[76] History of Preventive Medicine, U.S. Army Forces Middle Pacific, Office of the Surgeon, December 1941–September 1945. [Official record.]

measures followed established policies, and included education, operation of a number of prophylactic stations, monthly physical inspection, and reporting of information concerning probable sources of infection to military police. Early in 1942, a very competent venereal disease control officer was appointed by the department surgeon. This officer, in cooperation with the Director, Venereal Disease Control Division, Territorial Board of Health, made a very thorough study of factors affecting the incidence of venereal disease in the command.

Many aspects of the situation in Hawaii were unique. A system of organized prostitution existed in the Territory. Houses of prostitution had attending physicians who examined the operators at regular intervals. Some of these house physicians were physicians of high professional ability, and the practice was lucrative. There was a great excess of males over females in the community (fig. 52). Large numbers of troops and single male laborers were being added to the wartime population. There was a curfew, a blackout, and moderate prohibition, and the entire civilian population had been registered and fingerprinted. Travel between the Hawaiian Islands and the U.S. mainland was under absolute control. There were strong forces in

FIGURE 52.—Fort and King Streets, Honolulu, Hawaii, February 1945. Note preponderance of males, mostly servicemen.

the civilian community favoring the presence of organized prostitution. These forces included both a large group who obtained handsome financial support from a reportedly 10-million-dollar business and others who felt that the prostitution system had contributed to the low venereal disease incidence in the islands and was a protection to respectable women and girls of the community.

Considerable thought was given to the possibility of closing houses of prostitution. Venereal disease rates did not indicate that prostitution affected adversely the health of troops in the Hawaiian Department. To the contrary, venereal disease rates in the Hawaiian Department were approximately one-fourth those for the Army on the U.S. mainland. There was some concern as to what effect the closing of houses of prostitution might have upon the large community of single males under stress of hard work, wartime conditions, blackout, and curfew. There was apprehension that an increase in sex crimes might result from such action. Although a mere order by the military governor could have abolished organized prostitution in the Territory, no such action was taken.

The course taken by the Army toward the control of venereal disease in 1942 took the form of a vigorous program of prophylaxis, case finding, and thorough treatment. On 21 May 1942, the office of the military governor issued General Order No. 107, Section I of which outlined the control of communicable disease in the Territory of Hawaii and applied particularly to the control of venereal diseases. Physicians, both military and civilian, were required by General Order No. 107 to report by special messenger to the Territorial Board of Health all contacts within 24 hours after diagnosis of a case of venereal disease.

The Territorial Board of Health energetically followed up all contact reports, and large numbers of infected women and men were quickly placed under treatment.

An intensive drive was carried out by both military and civilian police to pick up and examine all streetwalkers in order to determine whether or not they were diseased. Hospitalization was provided under military control for all recalcitrant persons who did not take adequate treatment, for prostitutes who were found to be infected and who had not been reported by their private physicians, for prostitutes found to be infected after having been pronounced cured by their private physicians, and for streetwalkers. In December 1942, arrangements were completed for the hospitalization of all prostitutes found infected. Four well-equipped prophylactic stations were operated in Honolulu, and one in Wahiawa. As many as 50,000 prophylactic treatments a month were given in these Army stations.

This system of organized prostitution continued until the latter part of 1944. During this time, considerable controversy took place in the islands and in the United States concerning the organized prostitution existing in Honolulu. Those in favor of organized prostitution pointed to the low

venereal disease rates among military personnel in the islands and contended that, should organized prostitution be abolished, there would be an immediate rise in sex crimes and other criminal activities. Others opposed prostitution, not only on the obvious moral grounds, but also on the basis that experience elsewhere proved sex crimes and venereal disease were both reduced when organized prostitution was abolished. Hawaiian prostitution was almost a cause célèbre in the Army and among church and civilian health agencies.

In September 1944, after many conferences with local authorities, the houses of prostitution in Honolulu were closed. Similar houses in other places in Hawaii had been closed previously. After this action, there was no increase in sex crimes or other criminal practices and there was an additional decrease in the already low venereal disease rate among Army personnel. Concomitantly, there was a striking decrease in the number of prophylactics given in Honolulu.

From this experience, it may be concluded that the proponents of organized prostitution were mistaken as to its benefits.

Additional venereal disease measures employed in the Territory of Hawaii included the practice of inspecting all incoming personnel and requiring that a Wasserman examination be given each individual who, on physical inspection, was thought to have syphilis. By this technique, cases of gonorrhea and syphilis were picked up and treated in hospitals and the civilian population on the Hawaiian Islands was protected.

Australia and the Southwest Pacific

The control of venereal disease among troops based in Australia was a problem very closely related to the reservoir of venereal disease infection among the white civilian population. Fortunately, the venereal disease rates among civilians in Australia were low [77] at the time U.S. troops were first stationed there in 1942. This could have been attributed at least partially to the fact that general standards of morals and living conditions in Australia were among the highest of any of the nations of the world. The population consisted mainly of white people. There were none of the squalid or poverty-stricken slums found in many other countries. There had never occurred the severe famines of venereal disease. Before the war, Australia was a slowly industrializing nation of above average health. Venereal disease was not a health problem before 1942. There was licensed prostitution in most of the cities or communities of average size; this, however, did not become a problem until after the beginning of war in 1939. With the mobilization of Australia's army and the arrival of thousands of U.S. troops in 1942, a venereal disease control program finally became necessary. Throughout the war, Australia was used as a rest area for troops stationed on island groups nearby or in New Guinea (fig. 53). Hence, venereal disease rates

[77] Report, Lt. Col. Ivy A. Pelzman, MC, Venereal Disease Control Officer, Southwest Pacific Area (undated), subject: Venereal Disease in Australia.

from these areas reflected the rates in Australia and the efficiency of control measures in the centers of population.

Incidence in the civilian population.—A large number of cases of venereal disease appeared during and after World War I. It was difficult to determine in a satisfactory way just what the trend of incidence of venereal disease had been since 1920, but available statistics indicated that from 1920 to 1938 there had been a very definite decline in the incidence of syphilis, which, in its primary stage, had become a rarity. Gonorrhea showed some, but no marked, decline. With the arrival of Allied troops in 1942–43, there was a consistent increase in both syphilis and gonorrhea in those ports and areas where Allied troops were stationed. Civilian records showed this increase as most marked in females, since by this time the services had absorbed a large quota of the younger Australian males. As had been the experience in other countries, there was an increase in infection of a relatively high proportion of girls in the teens and early adult life, and there was the usual experience of difficulty in controlling the promiscuous young girl.

FIGURE 53.—Many U.S. soldiers and sailors enjoyed the hospitality and companionship of Australian women as pictured in these "Midway Night" activities at an American Red Cross club in Brisbane, Australia, March 1945.

As was true in most other countries, the majority of patients with venereal disease in Australia gave as their source of infection the so-called enthusiastic amateur, not the professional prostitute. Although there were known brothels in all of the larger cities and towns, they were under a fairly adequate system of inspection until after 1939 when the mobilization of troops throughout Australia gave sudden impetus to commercialized and clandestine prostitution with a resultant rise in venereal disease rates.

Control in the civilian population.—The control of venereal disease among the civilian population depended almost entirely upon the activities of the chief health officer of each of the six states. This power was vested in the chief health officers by the National Security Regulations of the Commonwealth Government, which became effective on 1 September 1942. These regulations empowered chief health officers to take uniform steps for the compulsory medical examination of persons suspected of having a venereal disease and for their detention for treatment upon proof of infection. Unfortunately, in all except one of the states, the health department did not take full advantage of the powers given them under the National Security Act. The authorities appeared to fear enforcing legislation which might interfere with the liberty of the people. There was a general reluctance to institute practices which would bring venereal disease out into the open.

In addition to the general reasons given above, the shortcoming of civil venereal disease control activities could be attributed, in part, to the following specific reasons: Critical shortage of clinic facilities, particularly those for inpatient treatment; too long a delay in apprehension and examination of venereal contacts due to staff shortages; inadequate criteria and methods for diagnosis and tests of cure; practically no checkup and followup of delinquency in treatment; no effort to rehabilitate promiscuous girls; and insufficient epidemiological and contact-tracing work. However, these matters received far greater consideration after these assessments were made early in 1942, and many steps were taken to improve the situation.

Incidence in U.S. military forces.—The arrival of U.S. troops in Australia in the early months of 1942 soon gave rise to the necessity for venereal disease control measures. One of the earliest monthly venereal disease reports from Australia contained a rate of 63 per 1,000 per annum for an engineer unit stationed near Melbourne. The venereal disease rate for the 41st Infantry Division for the month of April 1942 was 13.3 per 1,000 per annum. By the month of May 1942 it had risen to 29.9 per 1,000 per annum, and by the end of June it had dropped to 22.0 per 1,000 per annum.[78] The venereal disease rate for the 32d Infantry Division during June 1942 was 9.03 per 1,000 per annum. By October 1942 the rate for this division had jumped to 31.3.[79] The peak venereal disease rate for all troops in Australia in 1942

[78] Semiannual Report, Surgeon, 41st Infantry Division, SWPA, for 1 Jan.–30 June 1942.

[79] Sanitary Reports, Surgeon, 32d Infantry Division, Southwest Pacific Area, for June and October, 1942.

(60 per 1,000 per annum) was reached during August. There was a general decline in the rate during 1942 which could be attributed not only to improvement of venereal disease control measures but likewise to the increased offensive action in the north. The latter resulted in the transfer of a large portion of the personnel out of the areas near the larger cities to locations where men were on the alert and there were fewer contacts. The problem of venereal disease control in the Southwest Pacific was rendered quite difficult due to the distribution of troops over a large area, in many instances in small units. Altogether there were 1,228 cases of venereal disease reported for the year 1942, with an average overall rate of about 35 per 1,000 per annum. However, the incidence of gonorrhea as reported did not fully reveal the entire picture, since there were many cases of so-called nonspecific urethritis, etiology undetermined.

During 1943, the incidence of venereal disease began to taper off gradually, with the exception of venereal disease rates among Negro troops. Although Negro troops stationed in SWPA (Southwest Pacific Area) made up about 6 percent of the total troops in that area, they were contributing 25 percent of the venereal cases. A certain Negro Quartermaster Truck Regiment [80] recorded the following rates:

Month:	*Rate* [1]
December 1942	88
January 1943	119
February 1943	243
March 1943	290

[1] Number of cases per annum per 1,000 strength.

Evidence from early 1943 through 1945 showed the preponderance of venereal cases among Negro troops. The venereal disease rate for Negro troops in 1943 ranged from a high of 102.07 per 1,000 per annum to a low of 34.6, with an average rate of 56.7 for the entire year of 1943. Due to the Australian white race policy, there were very few of the yellow or colored races on the Australian mainland, and, in practically all instances, the contacts of the Negro troops were white Australian women of the lower social strata.

Venereal disease incidence for 1944 and 1945 continued to decrease for the entire Southwest Pacific Area. During the summer of 1944, there was an increase in the strength of the command in the advanced area with a resultant decrease on the mainland. As there was little opportunity for sexual exposure in the advanced area, there resulted a corresponding monthly decrease in the venereal disease rate. The decrease in the strength of the command on the mainland was counteracted, however, by the large number of individuals coming to the mainland on furlough, and it was these men who continued to present the real venereal disease problem. The men on furlough each month made up only 2 percent of the strength of the command, but they contributed approximately 50 percent of the number of venereal cases

---

[80] Sanitary Report, Surgeon, 48th Quartermaster Truck Regiment, SWPA, for March 1943, enclosure 1 thereto.

each month.[81] Some furlough areas showed an extremely high incidence. The rates in the Sydney and Brisbane areas continued to be high. In both areas, the incidence in Negro troops was excessive. In Brisbane, the rate among Negro troops in November 1944 was 1,151 per 1,000 per annum.[82] By early 1945, the venereal disease rate for the entire Southwest Pacific Area had leveled off at approximately 7 per 1,000 per annum. The rates for January and February were 5.5 and 8.5, respectively.

Control in U.S. military forces.—The earliest efforts for the control of venereal disease by the U.S. Army in the Southwest Pacific Area consisted primarily of the methods suggested by unit venereal disease control officers and use of facilities provided by Australian military and civilian authorities. These venereal disease control measures were similar to those employed in the United States.

A cooperative relationship was established and maintained between military and civilian authorities throughout Australia for the purpose of suppressing prostitution and apprehending venereal disease contacts. The Surgeon, Base Section No. 2, reported in April 1943:

> Since the houses of prostitution in Townsville and Cairns have been placed "off limits" to U.S. troops, there has been a notable decline in the incidence of syphilis. Apprehension and detention of infected women has improved slightly. At present there are seventeen * * * women under treatment for venereal disease in the Townsville General Hospital; most of them being there as a result of activities of the local Police in conjunction with the Venereal Disease Control Officer.

An investigator of the Provost Marshal's Office was assigned to the venereal disease control officer in each base section to assist in obtaining contact information. By means of close liaison with civilian vice squads and local health authorities, this investigator aided materially in the apprehension of venereal disease contacts. There was a continued improvement in contact information, and in early 1944 an average of 60 percent of contacts reported were apprehended and placed under treatment. In several communities where houses of prostitution existed, the areas were declared off limits to U.S. Army personnel. Certain cafes and hotel lounges, given as locations of many contacts, were likewise declared off limits.

The educational facilities available, such as posters, pamphlets, informative matchbook covers, movies, and sex hygiene lectures, were used continuously in an effort to reduce the number of venereal disease cases. The following is from the report on one regimental surgeon concerning his education program:

> Posters * * * depicting the importance of prophylaxis have been prepared by this detachment from materials purchased from the Regimental Fund. Each company, as well as Regt Hq Det, has received a poster and these are now displayed in company orderly rooms, or latrines—locations where the most men will see them the most times. Since several different posters were made, it is planned to rotate them from time to time * * *. A dramatization of the evils of sexual intercourse * * * has been written

---

81 Essential Technical Medical Data, USASOS, SWPA, for September 1944.

82 Essential Technical Medical Data, U.S. Army Forces, Far East, SWPA, for December 1944.

and is now being played to different companies * * *. All roles are played by enlisted men of the medical detachment.[83]

During 1943 and 1944, leave and furlough ships traveling between the advanced zone and Australia had, as part of their permanent personnel, transport surgeons who gave talks on venereal disease, supervised the showing of venereal disease films, and directed the exhibit of posters. Mechanical and chemical prophylactic units were distributed to all leave personnel aboard the ships and they were provided with various venereal disease pamphlets and folders listing the addresses of all prophylactic stations on the mainland. On the return trip to the advanced zone, venereal disease inspections were made and all the ships were provided with facilities for diagnosis and treatment.

Conclusion.—From the first stationing of U.S. troops in the Southwest Pacific Area in 1942, the constant efforts of unit medical officers and, later, the full-time efforts of venereal disease control officers tended to reduce the danger of venereal disease among these troops. The full cooperation of Australian health and police authorities with U.S. Army military police and medical authorities aided greatly in control efforts. Prophylactic facilities and equipment were made easily available near all areas that might be reservoirs of infections. All available educational measures were used. The result was the lowering of venereal disease rates for U.S. troops in this area from a peak (reached only once) of 60 per 1,000 per annum to about 7 per 1,000 per annum over a period of approximately 3 years.[84] The operations to follow, unfortunately, were destined to upset again these rather tranquil rates.

The Philippine Islands

Soon after the invasion of the Philippine Islands, venereal disease became the most important medical problem. The incidence rose sharply from the January-February rates to 123 per 1,000 in May of 1945. Among Negro troops it reached 637 per 1,000 per annum. The Japanese had segregated and attempted to examine prostitutes, but, as the Japanese were driven out, these women scattered over the entire islands. The laws of the Philippine Commonwealth declared prostitution illegal, but it was condoned by the police and the courts. In such a setting, prostitution was rampant, contact-tracing poorly carried out, and the treatment of apprehended prostitutes haphazard. The incidence of venereal disease in the Southwest Pacific Area continued to increase as greater areas of Luzon were secured. In the Manila area, various estimates showed approximately eight thousand prostitutes. In

[83] Sanitary Report, Surgeon, 48th Quartermaster Truck Regiment, SWPA, for February 1943, enclosure thereto.

[84] The peak *mean rate* for any *one month* during this 3-year period, as compiled from Statistical Health Report summaries, was 45.8 per thousand per annum in May 1942, and the lowest rate of 4.2 occurred in November 1944.—J. B. C., Jr.

addition, opportunities for clandestine prostitution existed in every field, in any wrecked vehicle, behind any stone wall, and even in frontline gun implacements and foxholes (fig. 54).

It was soon evident that there was almost a complete lack of planning to compete with the venereal disease problem in the Philippines. There was a lack of trained personnel, short supply of educational and prophylactic materials, and insufficient education of troops as to what might be expected. Because of the extremely high rates even among fighting personnel, the deputy surgeon of the theater invited Colonel Sternberg and Dr. Moore, Consultant in Venereal Disease to The Surgeon General, to the Philippines to review the situation and to make such recommendations as seemed indicated. After a complete survey of the situation, Dr. Moore and Colonel Sternberg submitted on 6 June 1945 an analysis of the situation and their recommendations to The Adjutant General through the Commander in Chief, SWPA. This report was, for all purposes, a complete analysis of the prob-

FIGURE 54.—A section of war-ravaged Manila which provided unlimited opportunities for clandestine prostitution.

lem encountered in Asiatic areas as of that time. An abridgment of the report follows: [85]

Rates and trends.—The venereal disease rate in SWPA is rapidly increasing to a level so high as to interfere with the military efficiency of the command. The increase is limited to troops in the Philippine Islands, principally in Luzon and Leyte. In Luzon and Leyte, the increase has been progressive over the 4-month period, January through April 1945, and is apparently continuing. The April rates for troops in Luzon, including Sixth Army, Base Sections, and U.S. Army Services of Supply, are approximately 100 per 1,000 per annum; in Leyte, about the same. The overall April rate for Base X is 268 per 1,000; and in some small units of Base X and of the Sixth Army the rates have reached the alarming figures of 2,000 to 4,000 per 1,000.

If the approximate April 1945 rate of venereal disease incidence in the Philippine Islands continues without increase or significant decrease, there will be among each million men stationed in this area about 6,000 cases of syphilis, 9,000 cases of chancroid, and 85,000 cases of gonorrhea per annum.

In absence of more vigorous control measures, the high rates in Luzon and Leyte may be expected to continue or still further to increase; a similar though perhaps lesser increase is probable in Mindanao as active combat ceases. The problem will become one of even greater importance as larger numbers of troops enter the Philippine area for leave or for staging in preparation for future operations. Available information likewise indicates a problem of equal magnitude should subsequent military operations involve large American forces in China, Japan, or both.

Venereal disease control measures involve not only the U.S. Army itself but also the civilian populations with which it comes in contact. In Allied Nations (the Philippine Commonwealth and China), the cooperation of the Army in civilian control measures represents a most difficult and delicate problem in international relations, the approach to which demands the utmost in tact and diplomacy.

Contributory factors.—The comparative rates in SWPA, ranging from very low to very high, reflect in part the incidence of venereal disease in the several civil populations encountered and in part the extent to which troops engage in sexual commerce with these populations. In the Philippine Islands, the rapidly rising venereal disease rate is not limited to troops stationed in or with ready access to Greater Manila (though this area is certainly the worst spot) but involves also personnel in smaller communities and in rural areas. Contributory factors in the Philippines are as follows: (1) Previous sexual starvation of troops stationed for months or years in Pacific islands; (2) the large number of professional and clandestine prostitutes, almost certainly increased by civilian destitution, and the extraor-

[85] Letter, J. E. Moore, M.D., Consultant to The Surgeon General, and Lt. Col. Thomas H. Sternberg, MC, to Adjutant General, U.S. Army, Washington, D.C. (through: Commander-in-Chief, SWPA), 6 June 1945, subject: Venereal Diseases in the U.S. Army in the Philippine Islands, and Recommendations for Their Control.

dinarily high incidence of venereal disease among these women, 75 percent of whom have one or more venereal diseases (fig. 55); (3) unusual lack of recreational facilities, especially in the Manila area; (4) unlimited access to alcohol in the Manila area; and (5) misconceptions among military personnel as to the "safety" of prostitutes and the uniform success of prophylactic and treatment measures.

Control program for the Army.—Recommendations for strengthening the venereal disease control program in the U.S. Army in SWPA include the following:

1. Increase the number of venereal disease control officers and assign full-time control officers with adequate transportation to each major Army or Air Force command, each field army, and each smaller unit (division et cetera) whose venereal disease rate and geographical location warrant assignment of a full-time control officer. These control officers should so far as possible possess special training in the venereal diseases and in public health. To the extent that such specially trained officers are not now available in SWPA, they may be obtained on request from The Surgeon General.

2. Prosecute immediately a vigorous educational program through both medical and command channels, utilizing lectures, posters, pamphlets, radio,

FIGURE 55.—House of prostitution with signs proclaiming hours of operation and indicating the nearest U.S. Army prophylactic station.

special demonstrations, and films; some of these materials may be obtained through requisition from The Surgeon General, War Department, Washington, and some should be locally produced. The portion of the education program directed toward troops should be written in G.I. language and so presented as to attract attention and interest. To this end, request the assistance and services of the Information and Education Section, USAFFE, for purposes of determining types of material and methods of presentation most likely to be effective under conditions existing in SWPA; further, this information should be obtained through a special study carried out under the aegis of the Information and Education Section by a research team requisitioned from the War Department for temporary duty. A general health education program should also be directed to women of the Armed Forces serving in SWPA, to include information relative to the venereal diseases and their prevention. Finally, this educational program, in addition to imparting ordinary information to troops in respect to the venereal diseases and their prevention, should stress the following: (1) Methods which line and medical officers should employ in the control of venereal disease; (2) the fact that syphilis is still a serious disease despite penicillin and that penicillin has no therapeutic effect in chancroid, lymphogranuloma venereum, and granuloma inguinale; (3) the fact that prostitution cannot be made safe through medical examination and that over 75 percent of prostitutes in this area are infected with one or more venereal diseases; (4) the increased importance of prophylaxis, particularly the proper use of the condom; and (5) the regulations regarding rotation or shipment home in respect to infectious venereal disease.

3. Lay increased emphasis, through the Commander in Chief, on the responsibility of commanding officers for venereal disease incidence, in accordance with the provisions of AR (Army Regulations) 40–210, 25 April 1945, and take disciplinary action against commanding officers whose units continue to show high rates if all available control measures have not been employed.

4. Improve the statistical organization so as to provide and disseminate more quickly to medical officers and commanders available information as to current venereal disease rates in all units of the command. To accomplish this, an officer especially trained in medical biostatistics should be assigned to the Surgeon, USAFFE.

5. Increase the number of readily accessible prophylactic stations in Manila and other large cities and towns, and requisition from the War Department, or preferably activate within the theater, prophylactic teams as authorized by Tables of Organization and Equipment 8–500, 18 January 1945 (fig. 56). This recommendation is desirable in spite of the commendable provisions so far accomplished, since the presently existing stations are overworked and will certainly be inadequate to meet the needs of additional troops arriving in this area. Improve as rapidly as possible

FIGURE 56.—A poor and inadequate prophylactic station in Manila.

prophylactic stations in Manila with respect to size, equipment, and privacy, and request the U.S. Navy to open a suitable number of prophylactic stations in Manila to provide for its own shore-based personnel and fleet personnel on shore leave (fig. 57). Mechanical prophylactics (condom) and PRO-KITS should be made freely available to all military personnel going on pass or leave and to all Army and Navy personnel at prophylactic stations, information stations of the military police, and such other centrally located points in Manila as may be indicated. Authorize, in view of the demonstrated efficacy of a sulfonamide in a single oral dose of 2.0 gms. as prophylaxis against gonorrhea and especially chancroid, and in view of the high incidence of chancroid in this theater, oral sulfadiazine prophylaxis as an optional measure for the entire command (in addition to other prophylactic measures), and as an obligatory measure for those units with excessively high rates, especially those without medical officers or local prophylactic station facilities.

6. Continue to use the 93d Field Hospital as a special venereal disease hospital and expand its facilities at once to include a medical officer specially trained in syphilology (available through The Surgeon General's

FIGURE 57.—U.S. Navy personnel look for entertainment in Manila.

Office on request) and a complete laboratory equipped for serologic testing of blood and spinal fluid and bacteriologic culture of the gonococcus and *Hemophilus ducreyi.* (This provision will materially reduce the average number of days of hospitalization.) Create a special unit of clinician, bacteriologist, and pathologist at the 93d Field Hospital to investigate improved methods of prophylaxis, diagnosis, and treatment of so-called chancroid and to study its epidemiology. Activate additional special venereal disease hospitals as the need arises.

7. Alter throughout the theater the standard treatment of gonorrhea (now 100,000 units of penicillin in 5 divided at 2- to 3-hour intervals) to either one of the following two optional alternatives: (1) A total of 200,000 units of penicillin in aqueous solution given intramuscularly, 50,000 units per injection for 4 doses at 2-hour intervals, or (2) a total of 500,000 units of penicillin given orally in aqueous solution, 100,000 units every 2 hours for 5 doses.

8. Arrange for the Special Services Office, in collaboration with the American Red Cross, to develop a coordinated and greatly expanded plan for the immediate development of increased recreational facilities in the Philippine Islands, especially in Manila and other locations which may be

designated as leave or rest areas. These should include a central billeting office and billeting facilities for personnel of all ranks on pass or leave, including mess, bathing, and similar facilities. Further, the plan must provide for lounges; rest, writing, and indoor-game rooms; soft drink, beer, and snack bars; dances; motion pictures; beach bathing facilities; organized sightseeing; athletics; and large post exchange centers complete with bowling alleys, pool tables, restaurants, barbershops, soda fountains, clothing stores, et cetera. The plan must also give high priorities for transportation material, and labor for such construction as may be necessary to develop rest and leave camps, Red Cross installations, and all other athletic and recreation activities. Obtain a large increase in feminine Red Cross personnel and assign additional enlisted and officer personnel to special services in bases and base sections.

9. Arrange for the Chief of Chaplains to reiterate to all chaplains of units the desirability of frequently repeated emphasis by them to all ranks of the value of continence as a measure of disease prevention.

10. Institute disciplinary measures which should include the following:

Establish in Manila a curfew at 2300 for all personnel not actively engaged in the performance of duty, and, wherever possible, institute a bed check at 2330 for troops. Instruct unit commanders to give any personnel returning in an intoxicated condition compulsory prophylaxis, including oral sulfadiazine, whether or not exposure is admitted.

In troops stationed outside the Greater Manila area, permit entry into Manila to all ranks only while on duty, on special extended leave or on 24-hour passes, the latter to be granted to any individual not oftener than once a week. Whenever possible, arrange for men who are proceeding to Manila on leave or pass, whether for 24 hours or longer, to travel in groups under the charge of an officer or a noncommissioned officer.

Instruct all ranks that return to the United States, whether while on leave, while on rotation, or for separation from the Service, will not be granted to personnel with venereal disease during the infectious stage. Coupled with this information should be educational material concerning the frequent medical difficulty of determining noninfectiousness especially in syphilis.

Exclude civilians from all camp areas, except on official business.

11. Measures for the control of prostitution should include the following:

The work of the Manila Department of Health and the Provost Marshal of Manila in respect to examination and treatment of infected women should be continued and greatly expanded. In conformity with Philippine law making prostitution illegal and with War Department policy pertaining to prostitution in oversea theaters, have the Provost Marshal General, in cooperation with the Philippine authorities, carry out a program of vigorous repression of prostitution. The mere scattering of prostitutes from organized houses to individual operation as streetwalkers will reduce the number

559625v—61——21

of potentially infectious contacts with military personnel. Despite such scattering, prostitutes may still be apprehended, examined, and treated if infected.

Request the Philippine Commonwealth Bureau of Health to establish detention and treatment camps, in the Manila area and elsewhere as may be necessary, to permit the treatment of prostitutes, professional and clandestine, found to be infected with venereal disease.

To the extent to which civilian cooperation in carrying out the two preceding recommendations cannot be obtained, employ all appropriate military measures including the off-limits policy, to minimize the availability of prostitutes to military personnel.

Measures applicable to the civilian population.—It is understood that the U.S. Army is charged with responsibility for the Manila Department of Health and the Manila Police Department on a temporary basis only, pending the independence of the Philippine Commonwealth; moreover, the assumption of these functions by the U.S. Army applies to Greater Manila only. The problem of venereal disease in the civilian population, on the control of which depends in large part the incidence of these diseases in military personnel, is however one which extends far beyond Greater Manila to the Philippine Commonwealth as a whole, and far beyond the prostitution problem to the entire infected civilian population, male and female alike.

It is believed that so long as the Philippine Commonwealth remains in the status of an insular possession, funds for venereal disease control in the civil population could be made available to the Department of Health and Welfare of the Philippine Commonwealth from the U.S. Government through the U.S. Public Health Service. These funds might be accompanied, if desired, by the loan of trained venereal disease control officers of the U.S. Public Health Service to the Philippine Department of Health and Welfare. Further, it is believed that Federal funds and personnel through the Public Health Service could probably be made available to the Philippine Commonwealth after its change to an independent status. The provision of aid of this nature should be of inestimable value to the Philippine Commonwealth in the inauguration and prosecution of a program of venereal disease control in the civil population throughout the islands, should improve the public health of the people, and should provide employment to a substantial number of Philippine medical and ancillary personnel.

It is therefore recommended that, through appropriate governmental channels, negotiations be inaugurated with the Government of the Philippine Commonwealth looking toward a request from that Government to the Government of the United States for funds and U.S. Public Health Service personnel to be expended in cooperative effort with the Philippine Department of Health and Welfare for a program of venereal disease control in the Philippine civilian population. This program should be carried out for at least the period of time that substantial numbers of U.S. troops are stationed in the Philippine Islands.

Dr. Moore and Colonel Sternberg completed their report by recommending priority for personnel, transportation, construction, supplies, and equipment to facilitate the immediate prosecution of the program which they had outlined. In addition, they commended the following officers, who had worked indefatigably in attempting to curb the incidence of venereal disease among military personnel stationed in the Philippine Islands:

Col. J. P. Holland, Provost Marshal of Manila.

Col. Maurice Pincoffs, MC, formerly Director, Manila Department of Health.

Lt. Col. J. H. Carson, MC, Commanding Officer, 93d Field Hospital.

Maj. J. V. Ambler, MC, Venereal Disease Control Officer, Base X.

Capt. Ray Trussell, MC, Venereal Disease Control Officer, Civil Affairs Section, USAFFE.

This extensive report by Dr. Moore and Colonel Sternberg soon came into the hands of Brig. Gen. (later Maj. Gen.) Guy B. Denit, Surgeon, USAFPAC (United States Army Forces in the Pacific), who took immediate and vigorous action to implement the recommendations made therein. By the time General MacArthur's headquarters (USAFPAC) was ready to forward the report to The Adjutant General, the following actions, among others, had been taken:

1. *Command action.*—A letter was directed to all commanding generals of major commands emphasizing their responsibilities with respect to venereal disease control. A parallel directive, Circular Letter No. 29, was issued by the surgeon, General Denit, to subordinate medical officers outlining in detail the salient points of the report submitted by Dr. Moore and Colonel Sternberg and specifying how the recommendations could be implemented within the command.

2. *Education.*—A vigorous information and education program was started. A research team of information and education officers trained in venereal disease control was in transit from the United States to work on this program in collaboration with venereal disease control officers.

3. *Recreation.*—Special Services operations in the Manila area had increased tremendously under the great handicap of destroyed facilities. Repair of existing facilities had enabled the base to restore basketball courts, swimming pools, bowling alleys, moving picture theaters, and reading rooms. Rizal Stadium, of Olympic size, was the focal point of athletics serving as an exhibition ground for unit teams. This work was constantly being pressed to fulfill the responsibility of providing recreation for the men and for the purpose of attacking the problem of venereal disease. Billeting facilities in the form of a Manila leave area were provided for all ranks.

4. *Prostitution.*—Plans were being made to institute an active program of placing out of bounds all known houses of prostitution in the Manila area. This would include the apprehension and trial of prostitutes, maintainers, and other personnel engaged in prostitution. The commanding

officer of the Military Police Command had been advised of his responsibilities. The Secretary of Justice of the Philippine Commonwealth had assured complete cooperation. Special night courts were established in proximity to the social hygiene clinics (fig. 58). Plans were also being made for extension of this program to other bases. The Manila Health Department, assisted by U.S. Army officers detailed to that section, was

Figure 58.—Social Hygiene Clinic and Hospital No. 3 in the city of Manila.

carrying out an active program for the examination and treatment of hostesses and prostitutes (fig. 59). Approximately 7,000 had attended the social hygiene clinic at San Lazaro Hospital, Manila, at specified intervals. The U.S. Public Health Service was requested to provide personnel and financial assistance for the civilian venereal disease program for the Philippines by radiogram, 12 July 1945.

5. *Personnel.*—Four trained venereal disease control officers had arrived from the United States and were assigned to the following headquarters: Philippine Base Section, Replacement Command, Base K, and Base M. It was planned to assign similar personnel to the remaining commands and bases when they became available from the Zone of Interior. Additionally, 3 headquarters prophylactic platoons and 20 prophylactic detachments were requested from the War Department on the USAFPAC troop redeployment forecast.

The forwarding indorsement from General MacArthur's headquarters also commended Dr. Moore and Colonel Sternberg for the thoroughness of their survey of the venereal disease problem in the Philippines and for their detailed, highly constructive recommendations for its control.

FIGURE 59.—U.S. Army personnel helped in the routine checking, examination, and treatment of hostesses and prostitutes.

As this expanded program gradually went into effect, there was considerable improvement in venereal disease rates in this area, although they never attained the low rates which were desired.

China-Burma-India Theater

The China-Burma-India Theater was established in February 1942, with the arrival of Lt. Gen. (later Gen.) Joseph Stilwell, to increase the combat efficiency of the Chinese Army. The medical section was formally established on 28 March 1942 when a Services of Supply surgeon was appointed. Before that date, the 3,000 American troops in the theater had 10 medical officers assigned to them, but hospitalization and supplies were provided by the British. The theater grew slowly during the months immediately following, and the units, mostly of the Army Air Forces, were scattered across the whole of India from Karachi to Assam and over the Himalayan "Hump" into China. Venereal disease control presented special problems since the theater was predominantly noncombatant in nature, the units were widely disseminated, and transportation was often primitive or inadequate. Furthermore, medical officers as well as commanding officers frequently budgeted too small an amount of their attention to venereal disease control when the insect-borne diseases and those arising from poor sanitation appeared to overshadow the venereal disease in relative importance. Generally speaking, venereal disease rates for white troops, the majority of whom found racial barriers, remained comparatively low throughout the entire period of operations. Rates for Negro units, however, consistently ran several times higher than the theater mean.

A full-time venereal disease control officer arrived in the theater on 26 November 1942 and was assigned to the Office of the Surgeon, Services of Supply, at the headquarters in New Delhi, where he functioned in the capacity of theater venereal disease control officer. On 31 March 1943, he was transferred to the Office of the Surgeon, Headquarters, Rear Echelon, U.S. Army Forces, CBI (China-Burma-India Theater), located in the same city. This transfer was effected in order to facilitate the administration of venereal disease control among Air Force units and other units which came under the authority of the theater surgeon but not the Surgeon, Services of Supply. The venereal disease control officer noted that the added authority attending this new assignment was of definite value to him in his dealings with organizations that were not a part of Services of Supply.

The duties of the theater venereal disease control officer were to supervise and correlate the theater venereal disease control program which included the education, recreation, and discipline of troops; establishment of prophylactic stations; and the distribution of mechanical and chemical preventives.

The theater venereal disease control officer spent half of his time traveling about the theater, personally investigating trouble points and consulting with

officers of units having excessive rates. These field trips were the more necessary because of the lack of either full- or part-time trained venereal disease control officers. Neither the Tenth nor the Fourteenth Air Force had even a part-time venereal disease control officer, although assistant surgeons acted in that capacity when the occasion demanded. During late 1943 and 1944, the India-China Wing of the Air Transport Command had a medical officer devoting most of his time to venereal disease control. This officer cooperated with the theater venereal disease control officer in a manner that made the venereal disease control program in the Air Transport Command an excellent and highly successful one. In the fall of 1943, venereal disease became such a pressing problem at Base Section No. 2 that an officer was appointed by the base surgeon as venereal disease control officer in addition to his other duties as the officer in charge of the venereal disease ward of the 163d Station Hospital. However, his clinical duties demanded the greater part of his attention.

China was Advance Section No. 1 of the China-Burma-India Theater until the theater was subdivided on 26 October 1944 into the China and the India-Burma theaters. Since the majority of troops were stationed in India,[86] venereal disease control problems centered there rather than in China. However, rates for white troops ran consistently higher in China than in India. There were no Negro troops stationed in China.

Venereal disease control in China was the responsibility of the theater venereal disease control officer. Headquarters, Rear Echelon, U.S. Army Forces, CBI, was located in New Delhi, India, and was administered by means of the organization previously described. When China became a separate theater, the venereal disease control officer remained with the India-Burma theater, and venereal disease control in the China theater was taken over by the theater medical inspector.[87]

India.—Since the majority of troops in the theater were stationed in India, the chief venereal disease control problems arose there. According to Major Brumfield, the U.S. soldier in India found many fine people with whom he could mingle socially. He also was subjected to influences conducive to sexual exposure and the contraction of venereal disease. Major Brumfield, himself, and others found frequent exceptions to this statement, however. For example, the theater venereal disease control officer, Capt. Malcolm A. Bouton, MC, personally observed that white troops in India usually acquired venereal disease only when under the influence of alcohol because racial barriers and the general unattractiveness of the native women to American men mitigated against normal social contacts. A survey conducted by Special Services tended to support Captain Bouton's views.

---

[86] Report, Brig. Gen. Raymond A. Kelser, Col. Robert H. Kennedy, MC, and Col. Karl R. Lundeberg, MC, to Commanding General, U.S. Army Forces, India-Burma Theater, New Delhi, India, 9 Nov. 1944, subject: Report of Medical Department Mission.

[87] (1) Derr, R. H.: History of Venereal Disease Control in China. [Official record.] (2) Essential Technical Medical Data, U.S. Army Forces, China Theater, for March 1945.

Measures for the protection of the public health at the national level were under the supervision of the Public Health Commissioner of the Indian Medical Service. This service was primarily a military one, but it had a civil branch to which officers might transfer and retain their military rank and right to promotion. These officers, assigned to the Government of the United Provinces and serving as civil medical and health officers, had been recalled to military duty. This resulted in the almost complete disruption of the service. Even before the war, very little progress had been made toward the building of a sound public health program because of insufficient personnel and a lack of appreciation on the part of the illiterate native population. Sanitation, except in the European sections of the large cities, was almost nonexistent, and absolutely nothing had been done to control the venereal diseases. Furthermore, it was indicated that the inauguration of venereal disease programs would have been prevented by the more powerful religious groups who would have interpreted the effort as an insinuation of sexual promiscuity which their religions prohibit. Consequently, while promiscuity did exist, the moralists would not permit anything to be done about it, preferring to follow their own religious dictates and refusing to recognize that all of the people were not guided by them. There had been no attempt to secure case reports for venereal disease, no surveys, no follow-up of delinquent patients, and no educational program. Under existing conditions, no one had the temerity to attempt such measures, as neither the Moslems nor the Hindus would have permitted it. Obviously, there was no reliable information regarding the presence of venereal disease in the civil population. Data relative to syphilis were available from only two sources: First, autopsies on unclaimed bodies, about 15 percent of which showed evidence of syphilis, and second, serologic tests among women attending prenatal clinics, about 4 percent of which were positive. It must be remembered that these samples were highly selected, representing the lowest social group on the one hand and the more intellectual class on the other; the rate for the entire population probably lay between these extremes. As the British Commissioner of Health declared during a conference with the venereal disease control officer, vital statistics were conspicuous by their absence.

Facilities for the treatment of the venereal diseases were provided at the general clinics throughout the provinces, especially in the largest cities, but it was understood that they handled but few patients. Indians married very early in life, and attendance at a venereal disease clinic was tantamount to admission of infidelity. Few Indians were willing to admit this transgression. Accordingly, the hands of the civilian authorities were tied insofar as attempts at venereal disease control were concerned.

In spite of the strong religious opposition to sexual promiscuity, flagrant prostitution was practiced in India. The caste system protected and promoted this profession. The prostitutes were among the lowest classes and the religious sects had no interest in them. Female children of prostitutes

were, from birth, destined to prostitution. There was no other recourse. Each of the large cities had its segregated areas of prostitution. The more expensive brothels in the principal cities offered the lighter-skinned, Eurasian women amid fairly pleasant surroundings, while the cheapest housed physically repulsive females in an environment of filth disgusting beyond description. Smaller towns and cities usually boasted of a few houses of the cheaper variety. Clandestine prostitution also was common, "tonga wallahs" and taxi drivers participated in the profit of the business. In the rural areas, such as Assam, organized prostitution was not found to any extent, but teapickers and coolie laborers were only too willing to add to their paltry earnings. This class was amoral rather than immoral.

The Surgeon, Services of Supply, CBI, observed:[88]

> During the year [1942] venereal disease at Karachi caused alarm. Newly arrived colored contingents were responsible for the outbreak. Although there were then four prophylactic stations at Karachi, they were ineffective so far as these troops were concerned. The colored soldiers were "duck soup" to the Indian prostitute. This difficulty with colored troops has continued, and although all known education and protective measures are carried out, the problem has not been solved.

The theater strength increased rapidly during the latter part of 1943, and, with the general increase, came a shift in the disposition of troops. Calcutta, the headquarters of Base Section No. 2, became increasingly important as Karachi diminished in importance. By the middle of 1944, roughly one-third of the total theater strength was assigned to Base Section No. 2. A large proportion of the base strength was stationed in or around Calcutta and, unfortunately from a venereal disease point of view, the city was designated a rest center for men who had been isolated for many months in the jungles of Assam and northern Burma. Calcutta, then the second largest city in the British Empire, had an unenviable reputation as regards Far Eastern vice of all kinds and became venereal disease problem number one.

The brothels of Calcutta were not conveniently concentrated like those in Karachi but were scattered throughout the city (fig. 60), making the enforcement of off-limits regulations most difficult. Houses varied widely in prices charged and in relative attractiveness.

Bombay presented a similar problem except that there, as in Karachi, the brothel section tended to be more integrated in one area. Also, large numbers of U.S. troops were never stationed in and about Bombay, as was the case in Calcutta. Bombay, however, caused considerable trouble at times as a port of debarkation.

These three major cities were foci from which most of the venereal disease arose. Karachi caused trouble during the early days of the theater, Calcutta later. Bombay drew attention to itself periodically when large contingents of troops were debarking. Contact reports indicated that the majority of infections were acquired in the brothels of Calcutta, Bombay,

---

88 History of the Medical Department, Services of Supply, China-Burma-India Theater, 1942–44. [Official record.]

FIGURE 60.—U.S. Army military police patrol the brothel area of Karachi to apprehend any military violators of the policy making this area off limits.

and Karachi. Exposures occurred when troop movements passed through these towns and while men were visiting them on leaves. The remainder of contacts were scattered. Some of the smaller towns were declared off limits because they were foci of venereal disease.

Negro organizations, rest camps, and ports of debarkation were ever-present problems which contributed a great deal toward high rates and toward sudden unexpected fluctuations in otherwise rather stable rates.

Educational material such as posters and pamphlets was at a premium during late 1942 and early 1943 because of shipping difficulties. In January 1943, there were only two types of venereal disease posters available for theater distribution, and these were inadequate in number. This situation was relieved in April of 1943 when a booklet containing photographic miniatures of posters was received from the Office of the Surgeon General (fig. 61). These miniatures were used as samples from which local Indian printers prepared a supply of the standard-sized, colored posters, pending the arrival of shipments from the States. After these early difficulties, adequate stocks were kept on hand most of the time by the simple expedient of supplementing U.S. printed posters with the Indian version when stock levels became low

FIGURE 61.—One of the photographic miniature posters received in the CBI Theater from the Office of the Surgeon General.

between shipments. However, the locally produced posters did not have the eye appeal of those made in the States.

The Office of the Surgeon, India-Burma Theater, feared that the lay publicity given to sulfonamides and penicillin would unfavorably influence the venereal disease educational program. This fear was borne out by casual conversations with enlisted men, many of whom thought that venereal diseases were now less serious. To offset this belief, an article on the subject was included in the December 1944 issue of the Services of Supply, India-Burma Theater, Field Medical Bulletin, a publication widely read by medical officers. The article requested that officers consider these overly optimistic views when giving lectures on venereal disease. It also requested that medical officers treating venereal disease have a private talk with each patient before discharging him, explaining to the soldier that many of the venereal diseases were still most serious and that he might not be so lucky as to be easily cured the second time.

During late July 1944 [89] the Research Department, Special Service Section, conducted a study of attitudes, actions, and knowledge as related to venereal disease. The study was made at the request of the theater surgeon's office to furnish some data that would be of value in focusing the educational aspects of the venereal disease control program in the theater. The questionnaire used was devised in consultation with the venereal disease control officer and administered by the staff of the Research Department, Special Service Section, Headquarters, U.S. Army Forces, CBI. The study was done on carefully randomized samples of Negro and white soldiers at two Army stations in the theater, one near a large city and the other in rural upper Assam. It was of interest to find that at the urban station 93 percent of the Negro and 27 percent of the white personnel admitted having had sexual intercourse since arriving in the theater, whereas at the rural station 71 percent of the Negro and 17 percent of the white made a like admission. Drinking seemed to have no important relationship to sexual behavior among Negro soldiers; for white soldiers, however, the association was highly significant. It was also found that the majority of sex contacts were made in brothels rather than from "pickups" or friends. An analysis of the report made by the Research Department was of aid in the handling of educational aspects of venereal disease control among white and Negro racial groups, even though many of the findings merely bore out what was already suspected. As a rule, lectures to white troops stressed the seriousness of venereal disease and the dangers of mixing alcohol with sexual relations and offered prophylaxis as a last resort. On the other hand, prophlyaxis had to be the constant theme of talks to Negro units. Recreational activities which were intended as a substitute for sexual activity had less of an effect upon the venereal disease rates in Negro organizations.

The locating of prophylactic stations was difficult because Indian property owners would not rent buildings for such purposes. However, from the very earliest days of the theater, prophylactic stations were always adequate in number and strategically situated. As the theater expanded geographically and numerically, stations were added or subtracted as the occasion demanded. Karachi had four stations functioning in the fall of 1942. Calcutta had two in the central part of the city in the fall of 1943, to which nine more were added during 1944. In New Delhi, there were two downtown and one outside of town near the airfield. Bombay kept one station in continuous operation and added temporary ones during the debarkation of troops. Small towns which were in bounds and in the proximity of Army installations had one station. In addition, prophylactic facilities were available on all U.S. Army posts and installations. The addresses of offpost prophylactic stations were conspicuously displayed on unit bulletin boards, and for the larger cities schematic maps were also posted. Units in Assam were

[89] Essential Technical Medical Data, U.S. Forces, India-Burma Theater, August-October 1944, enclosure 2 thereto.

provided with these maps for the convenience of men who visited Calcutta on rest leave. Later, a booklet was published which located the stations in all five of the major cities. Conversations were frequently held with the British venereal disease control and liaison officers concerning the mutual use of all prophylactic stations by personnel of both armies in order to obviate the duplication which existed. The plan was never carried out, however, as the British prophylactic scheme did not conform to the procedure outlined in U.S. Army regulations.

Supplies of individual chemical and mechanical prophylactic kits had to be stored with care because of the unfavorable climate in the China-Burma-India Theater. An inspection of supplies during the summer of 1944 revealed that the silver picrate, in many cases, had deteriorated to such an extent as to be unserviceable. The kits were destroyed in October 1944 by War Department order, and the new, one-tube variety was requisitioned. Condoms of best-grade rubber deteriorated during the hot summer months. The rubber tended to adhere to itself along the line of folding, and when the condoms were unrolled multiple pinpoint perforations developed at these sites of adherence. Medical supply was instructed to store these items in the coolest and driest places possible, and post exchanges were warned that stocks on their shelves must undergo rapid turnover during the hot months.

Obviously, any venereal disease control program in India was predestined to be a one-sided affair; that is, strictly military, without any semblance of the cooperation by civil public health and police authorities which one would expect to find in a similar program within the limits of the continental United States. As described earlier in this history, there were no health departments worthy of the name, and civil police expressed surprise when control of prostitution was even mildly suggested. British authorities, for political reasons and because of possible repercussions which might occur at home, decided not to attempt to regulate or supervise the brothels.

In the absence of civil public health and police cooperation, the only remaining recourse was to place all native sections and brothel areas off limits, and to enforce the regulation by patrolling them with military police. This was done at all trouble points throughout the theater, and all military personnel found in these areas were taken to the nearest prophylactic station for treatment. Company punishment frequently attended second and third offenses by the same individual.

That venereal disease rates can be lowered solely by the strict enforcement of off-limits regulations was shown in the statistical report for the 4-week period ending on 27 April 1945:

> All venereal disease incidence rates showed a significant decrease for the April reporting period. The aggregate and whites rates have never been lower since the Theater had been established, and the colored rate is the lowest it has been since July 1944. The reason for these unprecedented low rates is probably due, to a considerable extent, to our efforts to prevent an outbreak among our troops of cholera and smallpox which existed in epidemic form in the civilian population during April. Because of the

presence of these epidemics, many cities and towns were temporarily placed out of bounds for transient troops, and movement within many of the larger centers of population was restricted for personnel assigned there. Decrease in the number of venereal exposures was the inevitable result of such measures primarily directed towards prevention of diseases unrelated to venereal disease.

The lowering of actual man-days lost because of venereal disease was a problem apart from, but no less important than, control of the incidence. This aspect of the program was greatly aided by the advent, in the winter of 1943, of the ambulatory treatment of gonorrhea and the attendant lessening of days lost. Noneffective rates dropped from an average of 2.7 per 1,000 per annum for the whole of 1943, to 2.0 per 1,000 per annum for the first 8 months of 1944, and further to 1.6 for May to September, inclusive, 1944. The ambulatory treatment played a large part in the reduction, as the lowered incidence of venereal disease during that same period did not entirely account for the decrease in the rate of noneffectiveness.

There were three special problems in venereal disease control that were of paramount importance. These problems probably were not peculiar to the China-Burma-India Theater, but they deserve brief consideration here. The special problem areas were Negro troops, ports of debarkation, and rest centers.

Negro troops, although they constituted only about 15 percent of the total theater strength, consistently reported rates sufficiently excessive to affect adversely the theater rate as a whole. Educational measures did not appear to be as effective in Negro soldiers as in white troops, but this alone may not suffice to explain the higher rates among them. In addition, the Negro soldier, identifying himself with the native population as an American Indian found no racial barriers. Consequently, prophylaxis became the chief, if not the only, means of controlling venereal disease among Negro troops, and even this broke down because of alcoholism, superstitutions regarding prophylaxis, and the remarkable nonchalance with which this race viewed venereal disease. The rates for white troops were actually excessive only in isolated instances and under special circumstances. In fact, if it had not been for the presence of a few Negro organizations, the theater would have had an enviable venereal disease rate.

Ports of debarkation were another important problem in the venereal disease control program. Theater rates were somewhat higher on a couple of occasions when large numbers of troops debarked, but were especially high when a Negro organization was among the new arrivals. Experience showed that sick bays and dispensaries either alone or in combination aboard ship were often incapable of handling the large number of requests for prophylactic treatment, which at times ran as high as 50 percent of the strength given shore leave. Also, venereal disease control was too likely to be entirely lost in the multiplicity of administrative problems connected with the transshipment of large numbers of troops. Personnel aboard ship could not be relied upon to initiate venereal disease control measures, but they were

expected to cooperate when the port commander and port surgeon had formulated a well-organized program before the ship's arrival. The venereal disease problem at the critical time of first shore leave was of sufficient magnitude to warrant the special attention of one officer designated by the port surgeon as responsible for the proper execution of control measures. It was felt that this procedure of having a prearranged control program and an officer present to see that it was actually carried out would pay big dividends by preventing many cases of venereal disease. The following additional measures were found necessary at ports of debarkation in the theater: (1) The setting up of temporary prophylactic station or stations, manned by shore personnel, in tents or convenient buildings at the wharf gate or gates; (2) the delivery of individual mechanical prophylactic units, on the basis of not less than two per man, to ships' adjutants (not to individual organizational commanders) for distribution; (3) the distribution to troops of information concerning the location of off-limits areas, prophylactic stations, and legitimate places of entertainment (movies and approved restaurants); and (4) the enforcement of off-limits regulations by military police familiar with the city, reinforced, when necessary, by ship personnel.

Rest camps were the third source of constant trouble, especially the one at Calcutta which was established for Negro troops on leave from the Assam and Burma jungles. The incidence of venereal disease would be low during those months when the bulk of Negro organizations were busily occupied in the rural areas of Assam, and highest when large units were sent on detached service to the Howrah rest camp in Calcutta (fig. 62). The situation was investigated by the venereal disease control officer in April 1944, and corrective action was taken. In addition to an intensification of the educational program and stricter enforcement of the curfew and off-limits regulations, the following specific measures were instituted:

1. Discipline was strongly stressed at a conference of all unit commanders, and responsible officers were called by the Commanding General of Base Section No. 2.

2. Three new prophylactic stations were added at key points within the city, bringing the total from eight to eleven.

3. Fifteen percent sulfathiazole was added to the calomel ointment used at prophylactic stations.

4. Sulfa-drug prophylaxis was authorized at the rest camp and for units of the base having excessive rates.

5. Noncommissioned venereal disease control officers were appointed in each Negro unit arriving at the rest camp.

Whether due to any one or all of the above measures, the rates of this section dropped significantly that spring and summer.

Shillong, which was the rest camp for white personnel on leave from the same areas, was also a problem but a less serious one as measured by actual numbers of cases.

FIGURE 62.—Howrah rest camp for Negro soldiers, Calcutta, India. A. Front entrance. B. Unattended side entrance neighboring directly on a very squalid section of the city.

During the spring of 1944, the weekly radio statistical health report was amended to include the reporting of all new cases of venereal disease. This innovation was a considerable improvement as the theater surgeon was able immediately to spot units having high venereal disease rates.

China.—The American occupied portion of China contained three major cities: Chungking, K'un-ming, and Kuei-lin, with the greatest concentration of strength located in and about K'un-ming. Total strength in China grew slowly from only a few thousand, mostly personnel of the U.S. Army Air Forces, in 1942 and 1943 to approximately 40,000 in 1945. Frequently during 1943, rates were not statistically significant because of the small mean strength involved.

Several years before World War II, a serologic survey of 10,000 persons in Chekiang yielded 20 percent positives. The experiment repeated with a similar group during the Japanese occupation in the late thirties revealed 40 percent positives. It has been estimated that from 20 to 25 percent of the working classes are infected, although such figures must necessarily be but rough approximations. Prostitutes in China, as in any country, were considered 100 percent infected. It was the consensus among those of long experience in the Far East that syphilis was a relatively mild disease with the Chinese in whom one saw many of the benign late lesions but few of the more virulent central nervous system manifestations. However, there appeared to be no attenuation of the spirochete, as the disease reverted to type when acquired by a westerner. Data regarding the other venereal diseases were wholly lacking; but it can be assumed that here, as elsewhere, they were proportionately more common than syphilis.

The general control program in China was essentially the same as that in India. There was a prophylactic station centrally located in each of the larger cities, and more were added at K'un-ming in the summer of 1944. Brothel areas were always off limits, and the entire city of K'un-ming was placed off limits after 2400 hours in June 1944 because of a rising venereal disease rate (fig. 63). Recreation facilities were adequate at hostels of larger installations but totally lacking at some small outlying posts, a situation which could not be rectified because of logistic difficulties. Personnel stationed in China were at the end of a long supply line, which meant that the amenities of life came to them later and in smaller quantities than they did to troops in India. In addition, the theater was unable to rotate personnel as planned during late 1944 and early 1945. These two factors gave rise to a morale problem, and it was noted that venereal disease rates were highest among those men who had been overseas the longest.

The venereal disease problem was a big one considering the relatively small number of men involved. Had the theater developed into a major theater of operations, venereal disease control would have been one of the chief problems in preventive medicine.

FIGURE 63. (*See opposite page for legends.*)

FIGURE 63.—The brothel area in K'un-ming, China, was declared off limits. A. Entrance to the area. B. Quarters of one of the prostitutes. C. A typical brothel.

Burma.—It was the opinion of the theater venereal disease control officer that venereal disease control was unnecessary in Burma as the areas occupied by U.S. engineer and combat troops were sparsely populated by head-hunting, Naga tribesmen. There were no civilian populations remaining in northern Burmese towns which were wrested from the Japanese during 1944. Any venereal disease occurring among units stationed in Burma was invariably acquired while men were at rest camps in India.

THE SOUTH ATLANTIC

In a land where the prevention of tropical diseases was of prime importance in the maintenance of the health of U.S. troops, venereal disease control again played a most important part in the overall health program.

From the time that the first American cadres arrived in Brazil, the control of venereal disease was a problem of major importance. From the very beginning, venereal disease rates for military personnel in this theater were excessive.[90] During the first full year of operation, 1943, the annual average venereal disease rate per 1,000 average strength was 102, and the minimum rate was 66. This rate was four times that in the United States and about six times that for white troops in the United States.

Since no Negro or Puerto Rican troops were ever stationed in this theater, rates were only for white personnel. This high rate is more impressive when one considers the fact that the average strength of the entire command included personnel on Ascension Island, who constituted one-fourth of the total theater strength. This island offered no possibilities for sexual contact, and the existence of any venereal disease on Ascension was concomitant with the arrival of new troops or with the granting of furloughs to the Brazilian mainland.

Subsequently, control programs were instigated throughout the theater that resulted in a steady decrease in the rate, which, though still far above that for the continental United States, nevertheless reflected the campaign to control venereal diseases.

Administration.—Liaison with the U.S. Navy was carried out through Lt. Comdr. John F. Shronts, MC, Venereal Disease Control Officer, Fourth Fleet, U.S. Navy. Liaison with the Navy was an important factor in venereal disease control because the Navy controlled most of the ports to which soldiers went when on pass or furlough.

All Army bases, larger posts, and medical installations had a venereal disease control officer who was a medical officer. In units that had no attached medical officers, a nonmedical officer was appointed as the venereal disease control officer and had as his assistant a noncommissioned officer from the same unit.

---

[90] Letter, Lt. Col. Thomas B. Turner, MC, to Commanding General, U.S. Army Forces, South Atlantic (through Surgeon, U.S. Army Forces, South Atlantic), 9 Nov. 1943, subject: Venereal Disease Control in the South Atlantic Theater, with enclosure thereto.

Advisory venereal disease control committees were organized among enlisted men. These committees proved their value by obtaining information and submitting criticism that could not be obtained from any other source. Similar committees were formed among officers at each post, base, or unit.

Control measures.—The problem of venereal disease control in Brazil differed from any similar problem within the continental limits of the United States. Troops were widely scattered at many small posts where airstrips and maintenance troops were stationed, and ferrying crews were furnished for the transatlantic air route.

Early in the history of the theater, most commanding officers in Brazil became cognizant that the control of venereal disease among their personnel was a problem of leadership which could not be shifted entirely to the Medical Department. This responsibility of commanding officers was brought to their attention by a theater memorandum [91] which stated that medical officers could initiate and supervise only and that the effecting of venereal disease control measures was a command duty and function.

At the request of the Commanding General, USAFSA (U.S. Army Forces, South Atlantic), Colonel Turner made an inspection and survey of venereal disease conditions in Brazil during the period 1 November through 11 November 1943.[92] Colonel Turner spent a period of about 2 weeks in the theater and visited all important posts and many minor units. He discussed problems with line and medical officers and conferred with officials of the Brazilian Government, including the Director of National Health and the director of the Venereal Disease Control Division. Colonel Turner recommended that every effort be made to enlist the support of civil health authorities in correcting bad sanitary conditions in areas adjacent to military camps; to increase the amount of instruction to soldiers concerning the dangers to health resulting from pursuing a personally irresponsible course of conduct; and to reduce contact with the highly infected civilian population by using all reasonable measures available.

Because of the excessive venereal disease rate in the theater, a conference on venereal disease control was held in the Office of the Surgeon, USAFSA, in February 1944. Present were the theater surgeon, the deputy theater surgeon, the theater medical consultant, the commanding officers of the 200th Station Hospital, near Recife, and of Ibura Field in the same vicinity, and Commander Shronts.

At this meeting, it was explained that the high venereal disease rate was caused by the high venereal infection of the civilian population and a social system that permitted prostitutes to flourish without restraint. Methods to combat these conditions were limited because of inability to control sources of infection. The conferees decided to concentrate on the education of the soldier relative to the need for prophylaxis after contact and also to recom-

---

[91] Memorandum No. 2, Headquarters, U.S. Army Forces, South Atlantic, 10 Jan. 1944, par. 10, Venereal Diseases.

[92] See footnote 90, p. 316.

mend that all available facilities for cantonment recreation be utilized in order to attract the soldier away from adjacent towns and villages in his spare time.

The social system of Brazil made it practically impossible for soldiers to meet girls of their own social standing. Because of this fact, our soldiers then sought, and were sought by, promiscuous women, both amateur and professional, a group with a very high venereal disease rate.

Posts were liberal with passes, and soldiers, because of their relative opulence, were soon sought by prostitutes. Civilian dance halls were not open to U.S. soldiers. Only at the lowest bars and dives with their accompanying filth and dirt were troops welcome.

Specific areas had their special problems. The city of Recife was described in a report as presenting the most difficult problems for the control of venereal disease. It was reported to be swarming with prostitutes who appeared to be subject to little or no limitation by local authorities. In Natal, conditions on the whole were unsatisfactory; but, as the town was small, control of military personnel was not too difficult to administer. Belem was described as a city in which conditions were more or less acceptable and control of military personnel was not difficult because transient personnel were not allowed to enter the town. Rio de Janeiro was no problem due to the fact that few troops were stationed there and recreational facilities were adequate.

After the initial period of organization and construction, specific venereal disease problems at each camp were recognized, and measures were taken to correct them as much as possible. Cantonment recreational facilities were enlarged and expanded, and every effort was made to make life for the soldier on the post more attractive. Educational measures prescribed by the War Department were followed, training films on venereal disease control were shown, literature was distributed to individual soldiers, and posters and placards were prominently displayed. Frequent lectures and informal talks were given to the men in order to keep them aware of the dangers of venereal disease.

Extracantonment measures consisted of placing adequate prophylaxis stations at central and easily available locations in towns, placing out-of-bounds areas where prostitution flourished, declaring off limits individual cafes and restaurants known to contribute to the delinquency of soldiers, and increasing numbers of military police where necessary.

Summary.—The military venereal disease control program in Brazil was intensive and, considering the obstacles, successful. From the time the program began, when rates reached 142 per 1,000 per annum for the theater and a peak of 335 for an individual post, there was a steady decline in the rate to a low point of 36 per 1,000 average strength per annum during May 1945. This decline reflected the program of civilian collaboration, education, provision of recreation, and command interest.

ALASKA

In the Alaska Defense Command and the Alaskan Department, the control of venereal disease during the period July 1940 to July 1945 was a minor, although nonetheless important, phase of the overall control of communicable diseases. Venereal disease was a much smaller hazard to the health of troops in Alaska and the Aleutian Islands than in any other area of comparative size in which U.S. troops were stationed.

No comprehensive survey of venereal disease among the civilian white population was undertaken, except during the spring of 1941 when blood tests for syphilis were made on approximately 75 percent of the adults in Anchorage and Juneau as part of a program of blood typing for civilian defense purposes. Analysis of the results suggested a low prevalence of syphilis among white residents of two representative areas of Alaska. This was in marked contrast to the number of cases of venereal disease found among Alaskan native groups, although a complete survey was never made because of the nomadic habits of the natives. In Nome, for example, the sources of infection, the majority of whom were the Eskimo or breed girls and women, had not been eradicated because civilian police and legal procedures were inadequate. The number of Eskimo girls and women in town had gradually increased due to their migration to Nome from the surrounding villages. The migration of these individuals was not under any apparent form of control or supervision. Fortunately, the relative isolation of small native communities within the Territory and the rigors of the climate aided in cutting down the spread of venereal infection from natives to whites. During the summer months, however, coastal shipping during the canning season, with its migration of native Indian, Aleut, Filipino, Chinese, Japanese, and white cannery workers, offered an annual reinfection with acute venereal infections. Male cannery workers coming from the States brought venereal disease from brothels of the West Coast, and, as ships touched Alaskan ports, new cases were to be found among white and native prostitutes (fig. 64).

Military and civilian authorities and public health agencies cooperated in the control, suppression, and partial elimination of the white prostitutes. Much greater difficulty was encountered in trying to eliminate the promiscuous native as a source of venereal disease. In most instances, the only method of stopping contact of soldiers with the native girls and women was to place native villages or areas off limits.

Factors influencing incidence among troops.—Probably the most important single factor in the development of venereal disease by soldiers in Alaska was exposure to the reservoirs of venereal infection in the native population. Almost all Army posts on the Alaskan mainland were located near native villages or white villages having a native section. In Juneau, for example, the port surgeon reported in December 1942 that a difficult

FIGURE 64.—A 1959 photograph of the Red Dog Saloon and Annex Rooms, Juneau, Alaska. During and before World War II, this was a thriving house of prostitution, known as Ferry Way Rooms, that catered to itinerant workers, military personnel, and local inhabitants. (Photograph courtesy of the Alaska Department of Health.)

problem existed at that station because of close proximity to the native population. Certain villages, Yakutat, King Cove, and Naknek for example, were declared off limits early because of outbreaks of venereal disease among troops soon after they were stationed near the villages.

Another important source of venereal disease was the prostitute, white, black, and native. In each of the principal Alaskan towns, there was a row of small houses containing prostitutes, one or two inmates to a house. The row or "line," as it was called, was usually in a rather well segregated area and represented nearly all of the commercialized prostitution in Alaska (fig. 65). A few native or halfbreed women solicited near bars or in back alleys, but their main object was to obtain liquor and not to give their bodies for purely monetary hire.

Control measures.—Before 1940, troops were stationed at Chilkoot Barracks in southeastern Alaska, and a few Signal Corps troops were scattered throughout the Territory. Venereal disease never became a problem until increased numbers of troops were stationed throughout Alaska in proximity to native communities or to white communities having native sections (fig. 66). The influx of large numbers of troops into native villages such as Yakutat and King Cove soon brought problems of venereal disease control. As there were no effective civilian controls, it became necessary for military

FIGURE 65.—A section of the "line" at Juneau, Alaska. (Photograph courtesy of Alaska Department of Health.)

authorities to place these villages off limits immediately and for the duration.

Between 1 July 1940 and 1 January 1942 a mutually cooperative relationship was established between military authorities and well-organized civilian communities such as Juneau, Anchorage, and Fairbanks (fig. 67). Native districts were placed off limits either routinely or as occasion demanded. Military police were placed where needed to prevent soldiers from entering forbidden areas and to prevent disturbances of the peace in tolerated "red light" districts. Prophylaxis facilities were provided at all times in Juneau and in each area. Any man found drunk was given a prophylaxis. Prophylactic stations were set up near all Army posts where there was any possibility of troops being exposed to venereal disease in nearby communities.

After 1 January 1942, the Commanding General, Alaska Defense Command, instructed commanding officers of all posts, camps, and stations to take appropriate measures to control any and all conditions that might adversely affect the health of their respective commands. During this same period, there was a marked exodus of civilian women and children from Alaska due to the possible hazard of remaining in a war theater. Many prostitutes left with this group. By summer of 1942, increased military pressure precipitated the closing of the "line" in Anchorage. As a result, many prostitutes scattered throughout the town or moved to other Alaskan towns. The "red light" districts of other towns were allowed to remain open so long as they did not constitute a source of venereal infection. Local authorities in Seward

FIGURE 66.—Isolated Chilkoot Barracks at Haines, Alaska.

finally closed the "line" in late 1944 after approximately 3 years of licensed operation with troops stationed nearby.

Open commercialized prostitution virtually disappeared in Kodiak, Juneau, Ketchikan, Fairbanks, and Nome during the time that large numbers of troops were stationed there. However, after V–E and V–J Days, some pressure was exerted in an attempt to revive prewar conditions (fig. 68).

Military venereal disease control policies in Alaska were almost universally effected by post surgeons and post medical inspectors in cooperation with military police and local and territorial health and civil authorities. Since the control of venereal disease was always a rather minor problem, there was never a full-time venereal disease control officer or section in either the Office of the Alaskan Department Surgeon or any of the stations in the Alaskan Department.

Sex hygiene and venereal disease information was disseminated regularly through lectures, films, pamphlets, and posters at all stations.

There was no venereal disease problem in the Aleutian Islands. There were but few natives in the Islands, and, after 1942, these were moved to southeastern Alaska. There were two or three white prostitutes at Dutch Harbor in 1941, and these were evacuated to the States in 1942.

FIGURE 67.—A postwar photograph of buildings that constituted the "line" at Anchorage, Alaska. (Photograph courtesy of U.S. Public Health Service.)

FIGURE 68.—Since the creation of Alaskan statehood, the old "line" in Juneau (fig. 65) has been cleared away. (Photograph courtesy of the Alaska Department of Health.)

The annual venereal disease rates among military personnel in Alaska per 1,000 population were as follows: For 1942, 6.8; for 1943, 3.2; and for 1944, 4.6.[93] These low figures were a reflection of a combination of circumstances—the active venereal disease control program on the mainland of Alaska, where such a program was needed constantly, and the stationing of a large military force in an area off the mainland where no opportunity for exposure existed.

THOMAS H. STERNBERG, M.D.
ERNEST B. HOWARD, M.D.

Part V. Immediate Postwar Period

CONCEPTS OF CONTROL

As Siler pointed out in his monograph on the history of venereal disease in the U.S. Army,[94] all previous wars had been followed by an immediate rise in the incidence of venereal diseases among troops. As early as 1944, there were signs that the same situation would prevail following World War II. Consequently, the Army, the U.S. Public Health Service, the Navy, and various civilian organizations began to make plans in an effort to prevent or minimize a rise in incidence after the cessation of hostilities.

The Public Health Service was instrumental in organizing a venereal disease control conference held in St. Louis from 9 to 11 November 1944, which was directed primarily toward the consideration of the immediate postwar period. At this conference, representatives of various military and civilian organizations discussed the current venereal disease control situation and made plans for the expected postwar rise in rates. Colonel Sternberg, representing the Army, discussed the subject from a military point of view. A portion of his address, which was later published in the 27 January 1945 issue of the *Journal of the American Medical Association*, follows:

> It is even now apparent that the approaching demobilization period will be accompanied by many serious problems in the control of the venereal diseases. During and following previous wars the incidence of venereal disease always reached epidemic proportions. While the maintenance of low military rates during the first three years of the current conflict justifies a feeling of achievement by all concerned, it is noteworthy that since the 1st of January 1944 the Army venereal disease rate for the continental United States has risen steadily to a present level of 36 per thousand men annually as compared to the 1943 rate of 26.3. Furthermore, it is our belief, based on the following considerations, that the Army rate in the continental United States will continue to rise for some time and may even reach World War 1 levels:
>
> 1. It is increasingly evident that a general letdown in the overall venereal disease control program, both military and civilian, is in progress.

---

93 Morbidity and Mortality in the U.S. Army, 1940–45, Preliminary Tables Based on Periodic Summary Reports. Prepared by the Medical Statistics Division, Office of the Surgeon General, Department of the Army.

94 Siler, J. F.: The Prevention and Control of Venereal Diseases in the Army of the United States of America. Army M. Bull. No. 67, May 1943—Special Issue.

2. The outstanding advances in therapeutic methods climaxed by the introduction of penicillin have resulted in (a) better reporting of venereal disease with a decrease in the amount of concealed gonorrhea, (b) a definite but as yet unmeasured effect on the will of the soldier to avoid venereal disease and (c) a reduction in the man days lost per thousand men annually from 1,280 in 1940 to a current record low of less than 300, giving rise to a further loss of interest in prevention.

3. As the result of overseas assignment, the group of young trained venereal disease control officers initially stationed in this country has been depleted almost to the vanishing point. While this has lowered the intensity of our venereal disease program at home, it is with a great deal of satisfaction that the downward trend of the venereal disease rates in all theaters of operation is recorded. The combined overseas rate for all American soldiers is now lower than for those stationed in the United States.

4. Troops returning from overseas areas have had an abnormally high venereal disease rate of infection, acquired after arrival in this country. This is an increasingly serious problem. It can be explained in part by the effects of long overseas duty and by the belief of these men that the girls in this country are free of infection.

It is obvious that these problems affect the civilian and military alike and present a rather gloomy picture for the immediate future. Despite this, it is our opinion that in the postwar period there will exist an unprecedented opportunity to reduce the incidence of the venereal diseases to a manageable minimum. This opportunity, to be fully exploited, will require a critical evaluation of our current control measures with a view toward their strengthening and expansion and a recognition of the changing aspects of venereal disease control brought about by more effective therapeutic weapons and by the mass wartime experience with educational and case finding procedures.

It is believed that in the planning for postwar venereal disease control the Army has much to offer in the way of material assets and experiences. It is our intention in this paper to discuss specifically these contributions not only with respect to actual demobilization procedures but also in relation to the strictly civilian activities of venereal disease education, case finding, and community action.

After the conference in St. Louis, there was considerable activity on the part of the military services and the Public Health Service toward the formulation of various plans which it was hoped would be of some effect in preventing an epidemic rise in venereal disease. However, none of these plans were of much value insofar as could be determined. The venereal disease statistics presented in appendix D reveal that, immediately after the cessation of hostilities in the European theater, the incidence of venereal infections skyrocketed. The same happened in the Pacific after V–J Day, and rates in the United States followed a similar pattern. This epidemic, as might be imagined, received a considerable amount of study and analysis by competent officers, and, although the solution never was found, it seems worthwhile to record some of these studies for the benefit of those who may at some time encounter similar problems.

WORLDWIDE EXPERIENCES

European theater.—The impact of the marked rise in the venereal disease rate in the European and Mediterranean theaters was so strong that Maj. Gen. Albert W. Kenner, Chief Surgeon, U.S. Forces, European Theater, was directed to make a survey of the situation and to make recommendations for

its correction. General Kenner's excellent report of September 1945 to the Commanding General, ETOUSA, follows:

1. In view of the unprecedented rise of rates for venereal disease among U.S. Military personnel in the European Theater since April 1945, the following summary and recommendations are presented for your information and consideration:

a. In the Zone of the Interior during the period of mobilization and since that time, the average annual rate has been between 28 to 35 per thousand. In some Service Commands, this rate has been as high as 40 to 45 per thousand per annum. The War Department has accepted any rate below 50 per thousand per annum but has been critical of those above 35. During the pre-operational period in the United Kingdom, rates for U.S. Forces averaged between 35 and 40 per thousand per annum. With the advent of D-Day and during the first months in France, rates among combat troops were as low as 5 per thousand per annum. As was to be expected, these rates increased for U.S. Forces as a whole on the Continent as static service installations were put in place. During the early combat phase, however, for all troops on the Continent, the average rate never exceeded 50 per thousand per annum, and for combat troops a rate of less than 25 per thousand per annum, and usually lower, was maintained throughout the period of active fighting. With the approach of the end of hostilities, there became apparent an unmistakable increase in the number of cases of venereal disease. Just prior to, and subsequent to, V-E Day, the rates mounted precipitously and on the average have continued to increase up to the present time with some moderate variation on a weekly basis. At the present time, an overall Theater annual rate of 190 per thousand has been reached. If this rate is maintained, it means that of every 1,000 soldiers in the theater, 190 will have contracted venereal disease each year. Considering the present theater figure of approximately 2,000,000 men, there would thus occur 380,000 cases of venereal disease during the year if the present strength and the present rate were maintained.

b. Because of the modern treatment of venereal diseases, loss of time from this cause has been materially reduced and in fact many cases of gonorrhea can be treated on a full duty status. However, with the cessation of hostilities and the redeployment of military personnel to the Zone of Interior, emphasis has passed from the conservation of time lost from sickness to conservation of health and the return of U.S. soldiers to civilian life in the United States free from infectious diseases including venereal disease. The current Assembly Area Command and Port requirements for physical inspection and checking prior to embarkation are designed to carry out this obligation. In spite of these precautions, concealed or incipient cases found their way aboard transport and were diagnosed only after reaching the United States. This has been the cause of unfavorable comment from the War Department and has necessitated the adoption of more stringent regulations. At the present time no U.S. personnel with a venereal disease in the infectious stage is permitted to board a transport irrespective of the fact that he might be treated and cured of gonorrhea during the voyage.

c. The venereal disease situation in this theater has been cause for comment in the American press. While some of these articles have been inaccurate they have all referred to a substantial increase in the incidence of venereal disease.

2. Prior to the war period the incidence of venereal disease among Europeans was higher than that among the U.S. population. High rates during wars are a matter of historical record. With the German governmental policies and with the demoralization incident to the loss of the war, it is not surprising that there is a great mass of venereally infected women available to the American soldier. This availability was increased with the cessation of hostilities when units became static by comparison, and individual soldiers had more time away from duties. In France and Belgium and other liberated countries, a somewhat parallel situation had existed prior to invasion and their popula-

tions embodied a large group of infected women who had had insufficient opportunity for treatment. It is not surprising that with the cessation of hostilities and the psychological reaction and let-down incident to the tremendous victory that large numbers of contacts have been made both in Western Europe and in defeated Germany. Unfortunately also the control of venereal disease has received wide and often times unjustifiable publicity and claims. The result of the latter has been that many soldiers and officers consider the acquisition of a venereal disease a mere incident and not as the contraction of a dangerous infectious disease subject to serious complications and in which even penicillin fails to cure in a significant number of cases.

3. In broad principle, the control of venereal disease resolves itself around the repression of prostitution; the prevention of as many sexual contacts as possible; the provision of adequate substitutive and recreational activities; the provision of prophylactic materials and well organized, equipped and operated prophylactic stations; and the provision of treatment facilities for infected military and civilian personnel (fig. 69). These measures cannot, because of their diversity, be carried out by any one agency within the Army. A successful control program requires the coordination and enthusiastic participation of the Provost Marshal, Special Services Officer, and the Surgeon. Contribution can also be made by the Chaplain. The combined efforts of these agencies can only be secured to the best advantage when guided and unified by command. It is on this basis that the War Department has insisted that the control of venereal disease is a command function and responsibility.

FIGURE 69.—Dermatology and venereal disease treatment center at Stuttgart, Germany, May 1946. Penicillin for treatment of venereal disease was provided free of charge by the U.S. Military Government.

a. The Provost Marshal has the means for repressing prostitution by the control of the individual soldier, by closing houses of prostitution, or by placing these and other premises "off limits" and enforcing this measure, and by having been delegated the authority to take into custody violators of military and civilian health laws. Experience in the theater has shown that when Provost Marshals take an active interest in measures for the repression of prostitution, excellent results have been produced, whereas when the opposite obtains, the venereal disease program is jeopardized because contacts between promiscuous women and soldiers cannot be reduced significantly.

b. The Special Services Officer is in position to furnish a variety of substitutive activities in the way of athletics, recreation, and entertainment.

c. The technical aspects of control can be contributed by the Surgeon and involves a preparation of educational material for soldiers, the furnishing of prophylactic materials and facilities, and the treatment of venereal diseases.

4. To meet the acute venereal disease situation in this theater, the combined efforts of all of the above agencies, together with complete command support, will be required. To assure this vitally essential coordination, the establishment of venereal disease control boards in major commands is strongly advocated: these boards to consist of the Chief of Staff or his representative; the Provost Marshal; the Special Services Officer; the Surgeon; and in Germany the AC of S, G-5, and the Chief Public Health Officer, G-5. A monthly meeting of these boards should be required, at which time venereal disease policies, problems and procedures would be reviewed and revised as necessary. Such a board would have the effect of concentrating into one board all of the authority and agencies required for a coordinated and effective venereal disease control program.

5. In Germany, the problem of venereal disease control cannot be disassociated as between the Military and Military Government. A concrete program with single directives or at least mutually complimentary directives only can accomplish the best results.

6. Recommendations. It is recommended that:

a. A firm Command directive reading substantially as that presented as Inclosure No. 1, be distributed with the least possible delay.

b. A Board of officers composed of the Chief of Staff or his representative, the Provost Marshal, the Medical Inspector, and the Special Services Officer be established in Headquarters, United States Forces, European Theater as a model and directing agency for similar boards in major commands as outlined in the accompanying directive and referred to above in paragraph 3.

c. A coordinated and uniform program embodying the principles outlined above be required for all commands within the Theater.

d. Full use be made of:

(1) Publicity on venereal disease.

(2) Educational, recreational, and entertainment facilities.

(3) Police power of the Provost Marshal for the repression of prostitution both organized and clandestine.

e. Authority be granted for the full utilization of prophylactic teams in all commands under the provision of T/O & E 8–500 and that facilities, equipment and materials be made available from Engineer and other sources for the establishment, and where necessary, construction of adequate numbers of satisfactory prophylactic stations.

Despite the adoption of many of the recommendations, the rates in the European and Mediterranean theaters continued at a very high level until the middle of 1946, at which time they began to subside. However, it was believed that the decrease in rates which occurred in late 1946 and in 1947 was due more to a stabilization of command and of the civilian population

rather than to any specific measure taken, except, perhaps, the treatment of civilian sources of infection.

The Pacific.—In the Asiatic and Pacific theaters, V–J Day was also followed by a marked increase in rates. This was particularly true among occupation troops in Japan (fig. 70). The March 1946 issue of *Health*[95] contained the statement: "The most important facts about the incidence of venereal disease overseas are the continued advance in the rate for troops in Japan * * *. From 117 in November the admission rate for venereal disease in Japan rose to about 180 in December and to 227 in January. It approximates current rates in the European Theater. In Korea, however, the situation is both stable and very favorable, according to advance reports. At 22 per 1,000 men per year the January rate for the XXIV Corps is but one-tenth that for troops in Japan."

As in the European theater, the situation in Japan improved with the stabilization of the occupation troops and with the reinstitution of civilian public health activities (fig. 71). The part played by the Public Health and Welfare Section of General MacArthur's occupation headquarters in abolishing legalized prostitution and in controlling venereal infections in the civil population of Japan is fully recorded in another volume of the preventive medicine series.[96]

South Atlantic areas.—The discussion on venereal disease control activities in the South Atlantic (p. 316) closed with a highly optimistic note. It was stated that all-out efforts in the area had brought about, in May 1945, the lowest rate experienced—36 per 1,000 average strength per annum. Regrettably, this excellent record could not be maintained. Following trends in the rest of the world, some of the highest rates to be experienced in the area occurred in late 1945. For a thousand average strength, the per annum rate for November 1945 was 122 and for December 1945 was 165.

Zone of Interior.—In the Zone of Interior, a marked increase in venereal disease rates occurred after V–E Day. Even more noticeable was the increase after V–J Day. The April 1946 issue of *Health* contains the following statement:

> The April venereal disease admission rate of 84 per 1,000 men per year for troops stationed in the United States appears to be in line with the general upward trend described in the previous issue of HEALTH.
>
> * * * * * * *
>
> There can be no doubt that the increasing incidence of the venereal diseases presents a serious socio-medical problem, for which an adequate solution requires as a minimum, an army-wide intensification of venereal disease control, and a more constructive program of recreation and education. More dissemination of information among the troops on the limitations of venereal disease therapy might have some effect in lowering the venereal disease rates.

---

[95] Monthly Progress Report, Army Service Forces, War Department, March 1946, Section 7: Health.

[96] Medical Department, United States Army. Preventive Medicine in World War II. Volume VIII. Civil Health Problems. [In preparation.]

559625°—61——23

FIGURE 70.—So-called "Geisha" girls were ready to lavish their attention on the American occupation soldier.

Here again, all venereal disease control measures seemed relatively ineffective, and rates did not appear to decline until the Army of the United States was demobilized and the majority of troops was again Regular Army.

Summary.—It is obvious from epidemic venereal disease rates which were encountered in the wake of victory that venereal disease control measures

FIGURE 71.—This high-class Japanese establishment has been judiciously placed off limits to U.S. Army troops

which seemingly were effective during the war were not sufficient to counteract the loss of discipline, the effects of leisure time, and the general confusion accompanying a massive demobilization. If a recurrence of this situation is to be prevented, other measures will have to be adopted or discovered. It was fortunate, however, that the treatment of venereal disease made such spectacular advances during the war that, despite high rates at the close of the war, noneffectiveness from venereal disease reached an alltime low as shown in tables of appendix D. Therefore, although this venereal epidemic was distressing to those in command and probably to the majority of those infected, it was nevertheless not the major medical treatment problem that it would have been before the discovery of penicillin and other chemotherapeutic agents.

THOMAS H. STERNBERG, M.D.
ERNEST B. HOWARD, M.D.

CHAPTER XI

Yaws

James H. Dwinelle, M.D.

Yaws, or frambesia, is a specific infectious, contagious, tropical disease caused by the *Treponema pertenue.* A primary granulomatous lesion appears at the site of inoculation, followed by similar secondary generalized skin lesions. Hyperkeratotic plantar lesions frequently occur in the secondary stage also. Some cases go on to a late or tertiary stage with lesions which break down with considerable destruction to the skin and underlying bone.

While this disease is limited by the Tropics of Cancer and Capricorn, it is endemic only in hot, damp, rural areas. It is common in the West Indies, the northern part of South America, and French Equatorial Africa. In the Far East, it is widespread in Siam, the Malay States, the Netherlands Indies, Ceylon, certain areas of India, Burma, Indochina, the East Indies, the Philippines, and other Pacific islands, especially the Samoa Islands. In Haiti, the incidence of the disease among the rural population is said to be 80 percent.

Yaws is essentially a disease of childhood, and 60 percent of the children in Haiti acquire the disease before puberty. Children in tropical countries wear very little clothing and almost never wear shoes. The unprotected skin is subject to cuts and abrasions through which the spirochetes may easily penetrate. Crowding and lack of personal hygiene favor the spread of the disease by direct contact or indirectly from infected articles. According to Kumm,[1] a tiny fly, *Hippelates pallipes*, may carry the spirochete from an infected wound to an open cut on another person's skin. Open sores, when uncovered, are often teeming with these flies.

Immunity is slow in developing as compared with syphilis. Superinfections can take place in up to 3 years, but after 10 years almost complete immunity has developed. There is no known racial immunity to the disease.[2]

Yaws is essentially a disease of rural areas. Where it is prevalent, syphilis is rare, while the reverse is true in cities. There is considerable evidence that one disease confers an immunity to the other.[3]

---

[1] Kumm, H. W., Turner, T. B., and Peat, A. A.: The Duration of Motility of the Spirochaetes of Yaws in a Small West Indian Fly—*Hippelates pallipes Loew.* Am. J. Trop. Med. 15: 209–223, March 1935.

[2] Strong, Richard P.: Stitt's Diagnosis, Prevention and Treatment of Tropical Diseases. 7th ed. Philadelphia: The Blakiston Co., 1944, pp. 392–407.

[3] (1) Schöbl, O., and Miyao, I.: Immunologic Relation Between Yaws and Syphilis. Philippine J. Sc. 40: 91–109, September 1929. (2) Turner, T. B.: Studies on the Relationship Between Yaws and Syphilis. Am. J. Hyg. 25: 477–506, May 1937.

The following control measures have been found desirable: Avoidance of direct contact with people who have open sores and with articles which have become contaminated from discharges from these sores; keeping parts of body subject to injury covered, especially the feet and legs; prompt treatment of all cuts and abrasions of the skin with a suitable antiseptic dressing to exclude flies and prevent infection; attention to good soap and water hygiene; and isolation and treatment of cases.

Army personnel should avoid natives in endemic areas, and those natives necessary as employees should be examined carefully to see that they are free from disease.

HISTORICAL NOTE

Yaws was first described by Oviedo in the 16th century. In 1881, Charlouis carried out several inoculation experiments to prove the contagiousness of the disease. In 1891, Dr. Numa Rât published a monograph giving quite an accurate and detailed description of yaws.[4] In February 1905, Castellani, working in Ceylon, discovered the causative organism which he later named *Treponema pertenue*.[5] He also produced the disease in monkeys. The next advance was made in 1911 when Nichols employed salvarsan in the treatment of the disease.[6] Since the discovery of salvarsan and the later pentavalent and trivalent arsenicals, these drugs have been used by the Government in the treatment of natives in the Philippines, American Samoa, the Canal Zone, and other territories administered by the United States where yaws was prevalent.

Yaws was not a military problem in World War I because the active arena was for the most part outside the tropics.

During the American military occupation of Haiti, the National Public Health Service of Haiti, under the direction of U.S. Navy Medical Corps personnel, carried out an extensive campaign against yaws. Large numbers of the rural population were given treatment. Extensive research was carried out as to the epidemiology, etiology, and pathology of, and immunity to, the disease.

In Jamaica, the Jamaica Yaws Commission, under the International Health Division of the Rockefeller Foundation, carried out careful studies of the disease from 1932 to 1937. Systematic treatment with regular followup observations, including serology, was instituted. It was found that the estimated attack rate in the total population for one control area had been reduced by 89.9 percent after 3 years.

---

[4] Rât, Joseph Numa: Yaws; Its Nature and Treatment; An Introduction to the Study of the Disease. London: Waterlow and Sons, 1891.

[5] Castellani, A.: On the Presence of Spirochaetes in Two Cases of Ulcerated Parangi (Yaws). Brit. M.J. 2: 1280, 11 Nov. 1905.

[6] Nichols, H. J.: Further Observations on Certain Features of Experimental Syphilis and Yaws in the Rabbit. J. Exper. Med. 14: 196–216, August 1911.

EXPERIENCE IN WORLD WAR II

During World War II, U.S. troops were stationed in many places in the tropical zone where yaws was endemic or epidemic. In order to prevent infections among the soldiers, contacts with the natives were discouraged, open wounds were kept dressed, and insect control was practiced.

Army medical officers in the Pacific had an opportunity to observe many cases of yaws. They set up clinics for the natives on most of the islands in military areas. The success of this procedure was reflected by the very low incidence of the disease among military personnel (table 31).

TABLE 31.—*Admissions for yaws in the U.S. Army, by theater or area and year, 1942–45*

[Preliminary data based on sample tabulations of individual medical records

[Rate expressed as number per annum per 1,000 average strength]

Theater or area	1942–45		1942		1943		1944		1945	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Continental United States	5	0	-----	0	4	0	1	0	-----	0
Overseas:										
North America	1	0	1	.01	-----	0	-----	0	-----	0
Middle East	1	.01	-----	0	1	.02	-----	0	-----	0
Pacific Ocean areas	5	0	-----	0	5	.02	-----	0	-----	0
Southwest Pacific	20	.01	1	.01	1	.01	3	0	15	.01
Other areas	-----	0	-----	0	-----	0	-----	0	-----	0
Total overseas	27	0	2	0	7	0	3	0	15	0
Total Army	32	0	2	0	11	0	4	0	15	0

In spite of the low rates of infections in U.S. troops, the staff of the Preventive Medicine Service, Office of the Surgeon General, because of its interest in the control of infectious diseases among the civilian populations, decided to investigate the possibility of utilizing penicillin for the control of yaws in such regions. After considering various locations where adequate numbers of yaws patients might be made available for study, arrangements were made with the Division of Health and Sanitation, Office of the Coordinator of Inter-American Affairs, and with the Government of the Republic of Haiti to conduct such experiments in that country.

In December 1944, the chief of the Preventive Medicine Service, Brig. Gen. James S. Simmons, accompanied by Lt. Col. (later Col.) Thomas H. Sternberg, MC, Chief, Venereal Disease Control Division, Lt. Col. Douglass W. Walker, MC, Executive Officer, Preventive Medicine Service, and Lt. Col. Charles R. Rein, MC, Chief, Division of Serology, Army Medical Center,

visited Port-au-Prince, Haiti, for a series of conferences with the author, who was chief of a field party and director of the American Sanitary Commission to Haiti, and with the President of the Republic of Haiti and members of his Department of Health. As a result, a cooperative field research project was set up in Haiti to determine the value of penicillin administered in various ways for the treatment and control of yaws.

At that time, there was very little information concerning the effect of penicillin on yaws. Mahoney, Arnold, and Harris [7] had demonstrated the effectiveness of penicillin therapy in early syphilis, and there were a few scattered references to the use of the drug in cases of yaws. It therefore seemed important to make a careful study of the problem, and especially to determine whether a method of administration might be developed by which yaws could be controlled with a single injection. The status of knowledge at that time is indicated by the following brief review:

Whitehill and Austrian [8] reported the treatment of 17 cases of primary and secondary yaws among Fijians. They used total doses of approximately 500,000 Oxford units of penicillin in aqueous solution, giving 15,000 Oxford units intramuscularly every 4 hours for 5 or 6 days. Dark-field examinations became negative in 16 hours after treatment, and most lesions healed in 1 week. No cases were rendered permanently seronegative with the Kahn test within 20 weeks, the extent of their followup period at the time of publication. Lofgren [9] reported the treatment of a white sailor who had contracted yaws on American Samoa. He used a total dose of 1,500,000 Oxford units of penicillin in aqueous solution over a period of 12 days. The dark-field examination became negative in 18 hours. All secondary lesions healed in 5 days, and the primary lesion, which had been ulcerated, in 13 days. The Kahn test became negative 5 weeks after treatment. Da Cunha, Area Leão, Nery Guimarães, and Cardoso [10] treated seven cases of yaws in Brazil with total doses of 9,600 to 52,000 Oxford units of penicillin, and obtained clinical cures in from 12 to 44 days. They stated that serologic reactions (Wassermann test) became negative 60 days after treatment in all cases. Da Cunha and Area Leão treated an additional five cases in Brazil with similar results. Findlay, Hill, and Macpherson [11] reported the treatment of 24 cases of yaws in children in Africa with 50,000 to 100,000 Oxford units of penicillin in aqueous solution over a period of 12 to 24 hours. Clinical cures were obtained in 6 to 7 days. Reversal of the Kahn test in two of the primary cases was attained in 7 days. In two of the secondary cases, the Kahn test remained

---

[7] Mahoney, J. F., Arnold, R. C., and Harris, A.: Penicillin Treatment of Early Syphilis; a Preliminary Report. Am. J. Pub. Health 33: 1387–1391, December 1943.

[8] Whitehill, R., and Austrian, R.: Treatment of Yaws With Penicillin. Bull. U.S. Army M. Dept. (No. 86) 3: 84–91, March 1945.

[9] Lofgren, R. C.: Yaws Treated With Penicillin; Report of Case. U.S. Nav. M. Bull. 43: 1025–1030, November 1944.

[10] Foreign Letters (Brazil): Penicillin in the Treatment of Yaws (Spirochetosis). J.A.M.A. 126: 1163, 30 Dec. 1944.

[11] Findlay, G. M., Hill, K. R., and Macpherson, A.: Penicillin in Yaws and Tropical Ulcer. Nature, London 154: 795–796, 23 Dec. 1944.

positive after 6 weeks. Tompsett and Kauer[12] reported five cases of yaws among Melanesians on New Guinea treated with total doses of 250,000 to 400,000 Oxford units of penicillin aqueous solution over a period of 2 to 4 days. The dark-field examination became negative in 24 hours, and the lesion healed in from 1 to 3 weeks. No serologic tests were made after treatment.

The survey of the literature seemed to indicate that the use of penicillin in the treatment of yaws invariably resulted in complete clinical cure, even in relatively small doses. On the other hand, only a few of the cases were observed to attain seronegativity with the Kahn or Wassermann test after treatment. Therefore, the value of penicillin in the treatment of yaws had not been definitely established.

Special Study in Haiti

A cooperative study was made by the Preventive Medicine Service of the Army, the Division of Health and Sanitation of the Office of Inter-American Affairs, and the Government of the Republic of Haiti to determine the effectiveness of penicillin for the treatment and control of yaws.

An account of the study appears in the final report of 12 months' followup observations.[13] Five hundred patients with primary and secondary yaws infections were treated. Clinical and serologic followup observations were made at monthly intervals for 1 year. The patients were divided into three series as follows:

Series A.—Two hundred patients were hospitalized and given a total of 1,200,000 units of penicillin sodium in aqueous solution each over a period of 4 days. They received 30 intramuscular injections of 40,000 units each, 1 injection every 3 hours during both day and night. All patients received the same total dose, regardless of age.

Series B.—One hundred and fifty-one patients were treated on a 2-day ambulatory schedule with penicillin calcium in peanut oil with 4.8 percent beeswax by weight (300,000 units per cubic centimeter). The dosage was graded down for children. Patients from 6 to 12 years of age received 600,000 units; those aged from 13 to 16 years, 900,000 units; and those 17 years of age or older, 1,200,000 units. The drug was given by intramuscular injection in divided doses 24 hours apart.

Series C.—One hundred and forty-nine patients were treated on a 1-day ambulatory schedule with penicillin calcium in oil with beeswax. The dosage was graded down for children as in series B. The drug was given by intramuscular injection in divided doses 10 or 12 hours apart. Figures 72, 73, and 74 illustrate the results in three patients 1 week after treatment.

A medical history was taken, and blood for serologic testing was collected, from each patient before treatment. Physical examination was limited

[12] Tompsett, R. R., and Kauer, G. L.: Penicillin Treatment of Early Yaws. Am. J. Trop. Med. 25: 275–276, May 1945.

[13] Dwinelle, J. H., Sheldon, A. J., Rein, C. R., and Sternberg, T. H.: Evaluation of Penicillin in the Treatment of Yaws. Final report. Am. J. Trop. Med. 27: 633–641, September 1947.

559625ᵛ—61——24

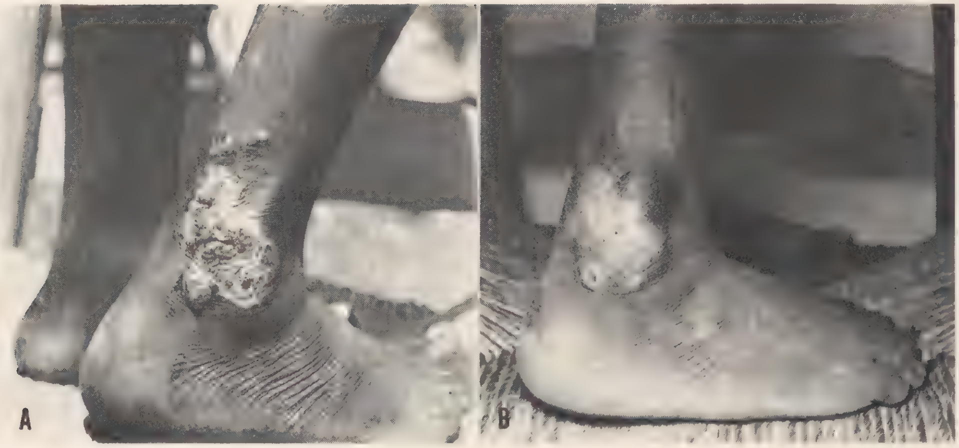


FIGURE 72.—Case Number C82. Primary yaws of the heel. A. Before treatment. B. One week after treatment with 600,000 units of penicillin in oil and beeswax, two doses in 24 hours.

FIGURE 73.—Case Number C83. Secondary yaws. A. Before treatment. B. One week after treatment with 600,000 units of penicillin in oil and beeswax, two doses in 24 hours.

FIGURE 74.—Case Number C84. Secondary yaws (condylomata). A. Before treatment. B. One week after treatment with 600,000 units of penicillin in oil and beeswax, two doses in 24 hours.

to close observation of the skin and mucocutaneous borders. Blood serum was placed in vials containing powdered Merthiolate (thimerosal), 1 mg. per cubic centimeter of serum, and shipped by air to the Division of Serology, Medical Department Professional Service Schools, Army Medical Center, Washington, D.C. Fewer than 1 percent of the specimens arriving there were unsatisfactory for testing as a result of bacterial contamination. A battery of serologic tests was performed on each specimen: Kline diagnostic, Kline exclusion, a new microflocculation test employing cardiolipin antigen, Mazzini, quantitative Kahn, and quantitative Kolmer. Only the quantitative Kahn titers were reported in this paper. The other tests employed in serodiagnostic battery were more sensitive than the Kahn and gave higher titered reactions, but in all tests there was a similarity in the general pattern and in the amount of serologic improvement.

Followup clinical and serologic observations were made at monthly intervals on patients in series A and at 3-month intervals on those in series B and C. In a number of instances, blood specimens were lost, the tubes were broken in shipment, or the quantities of serum were insufficient for testing. In these instances, although a clinical examination had been made on each patient during the month concerned, the clinical observations have not been included in this analysis since a corresponding serologic observation could not be made.

The clinical improvement of patients in series A during and immediately following treatment was rapid and remarkable. Joint pains disappeared in from 24 to 48 hours; plantar and palmar "crab" lesions became painless in from 48 to 72 hours. Dark-field examinations gave negative results in from 8 to 10 hours. Stained sections made from biopsy material showed numerous

spirochetes for as long as 12 hours, only an occasional isolated spirochete for from 12 to 22 hours, and none thereafter. Both primary and secondary lesions began to dry up in 24 hours. Epithelium grew in from the periphery and completely covered most lesions in 3 or 4 days. The great majority of patients who returned for observation 1 month after treatment showed complete healing of all lesions. A few ulcerated primary lesions with secondary bacterial infections were still draining pus at this time. Most of these healed spontaneously between the first and second month after treatment. Since patients in series B and C were treated on an ambulatory basis, it was not possible to follow their immediate clinical courses. However, on the first followup observation 3 months after treatment, these patients, in most instances, showed complete healing of all lesions. Histological studies were made on biopsy specimens taken before and after treatment on 10 patients in series A.

No severe toxic reactions were encountered. Approximately one-half of the patients in series A had a rise in temperature from 100° to 104° F., 2 to 8 hours after treatment was started. All temperatures gradually returned to normal in from 10 to 12 hours. Approximately one-fifth of the patients showed a brief secondary elevation of temperature on the third, fourth, and fifth days of treatment.

Clinical response to treatment was uniformly excellent, but serologic response was not. Fifty-four cases were dropped from the original series of 500 because the pretreatment or posttreatment serums were either unsatisfactory for testing or not obtained. Only 16.6 percent of the remaining 446 patients were considered to show "apparent cure." An additional 75.1 percent showed "satisfactory progress," totaling 91.7 percent. The remaining 8.3 percent of the patients showed "unsatisfactory progress." In the latter group were included cases of "reinfection," "clinical relapse," and "serologic relapse."

The proportion of "apparent cures" in the group of hospitalized patients (those treated over a 4-day period with penicillin in aqueous solution) was 26.7 percent. This was a high proportion when compared with the 11 percent and 6.4 percent of apparent cures in two groups treated for 2 days and 1 day respectively with penicillin in oil with beeswax on an ambulatory basis. However, there was a correspondingly higher proportion of cases showing satisfactory progress in the latter two groups of patients so that when one combines cases of apparent cure with those showing satisfactory progress the total percentage is almost identical in the three groups of patients, 90.2, 92.9, and 92.8, respectively.

The results of these studies indicate that penicillin was the most effective and speedy therapeutic agent to quickly render yaws patients noninfective and was suitable for mass treatment of natives in any area. Penicillin given

over a longer period produces a serologic cure as well as a clinical cure. The serologic response is much slower than that of the corresponding stage of syphilis.

It is appreciated that followup observation over a period of 10 to 12 months after treatment is not sufficient to permit a comprehensive evaluation of the efficacy of penicillin in the treatment of yaws. Also, it is not possible to make a strict comparison of the results of treatment of penicillin in aqueous solution with penicillin in oil with beeswax, because of the difference in treatment schedules employed. However, it is felt that penicillin is probably the present-day drug of choice in the treatment of yaws, and that penicillin in oil with beeswax is of considerable public health value in countries such as Haiti where large numbers of patients must be treated on an ambulatory basis in rural clinics. Its use can be expected to control cutaneous lesions successfully and therefore prevent the spread of infection.

After the completion of these field studies, a program of yaws eradication was started in Haiti. The help of the World Health Organization was subsequently obtained in carrying this eradication program forward.

CHAPTER XII

Bullis Fever

Dwight M. Kuhns, M.D., and Capt. Donald L. Learnard, MSC

CHARACTERISTICS AND CONTROL

Among military personnel, as among civilians, obscure fevers, or fevers of unknown origin, have occurred frequently. Notable advances have been made by discerning clinicians who have been able to see within this heterogeneous group certain distinctive cases which subsequently have become recognized as representative of a previously unrecognized or new disease. In modern times, the clinical differentiation has been followed by confirmatory epidemiological and laboratory studies which have rounded out the conception of the disease as an entity. This was essentially the course of events that were set in train by the original observations made in 1942 by Col. John C. Woodland, MC, Chief of Medicine, Station Hospital (later named Brooke General Hospital), Fort Sam Houston, Tex. As a result, Bullis fever was recognized and was named for the camp and training area from which most of the cases came.

In April 1942, it became apparent to Colonel Woodland that, in the group of military patients suffering from various acute febrile diseases, there were a number who were ill with a clinical disease entity that defied definite identification. In June 1942, Colonel Woodland invited Dr. John R. Paul, Director, Commission on Neurotropic Virus Disease, Board for the Investigation and Control of Influenza and Other Epidemic Diseases in the Army, Preventive Medicine Service, Office of the Surgeon General, to visit the hospital as a consultant on the problem. One outcome of Dr. Paul's visit was a further request of the Preventive Medicine Service for assistance. As a consequence, a special advisory group of experts who accepted the invitations of the Surgeon, Eighth Corps Area, and of The Surgeon General went to Fort Sam Houston and Camp Bullis, Tex., in the middle of July 1942 to assist in the investigation. The members of this group were Dr. Kenneth F. Maxcy, consultant to the Secretary of War and a member of the Board for the Investigation and Control of Influenza and Other Epidemic Diseases in the Army; Dr. Norman H. Topping, Passed Assistant Surgeon, U.S. Public Health Service; and Dr. John C. Snyder, staff member, International Health Division, Rockefeller Foundation. In a preliminary report, dated 10 August 1942, to The Surgeon General, through Col. (later Brig. Gen.) James S. Simmons, MC, Chief, Preventive Medicine Service, this group expressed agreement with

the opinion of Colonel Woodland and his associates (especially Maj. M. M. McDowell, MC, and Capt. (later Maj.) John T. Richards, MC) that a typhus-like fever, possibly a tick fever, was probably a distinct disease among the patients suffering with acute febrile conditions who had been admitted to the station hospital at Fort Sam Houston.

Studies by other groups and individuals followed while Colonel Woodland and his associates continued their own studies of the disease. During 1943–44 a commission on Bullis fever was organized and administered by the Rocky Mountain Laboratory of the U.S. Public Health Service, Hamilton, Mont., under the direction of Dr. R. R. Parker. In addition, members of the staff of the Eighth Service Command Laboratory, Fort Sam Houston, Tex., the University of Texas, the Bureau of Entomology and Plant Quarantine of the U.S. Department of Agriculture, and various other organizations carried out clinical, experimental, and field investigations on the disease during the succeeding 5 years. The knowledge accumulated from these studies is the chief substance of this chapter.

In all cases studied, the onset was characterized by chills, headache, moderately high fever (102° to 105° F.) with nausea, vomiting, and lymphadenopathy.[1] The fever lasted from 4 to 7 days and subsided by lysis. Pronounced lassitude, prostration, anorexia, and general weakness were noted during the febrile stage of the disease, and the majority of patients complained of severe pains in the postorbital and occipital regions. Upper respiratory symptoms were not consistently found.

Differential diagnosis presented many problems. Signs, symptoms, and laboratory findings indicated that the disease, later called Bullis fever, was similar to, but not identical with, infectious mononucleosis. The comparison is presented in table 32.

Laboratory findings in all cases showed a tendency toward leukopenia, with associated neutropenia. Normal results were obtained in erythrocyte counts, hemoglobin determinations, urinalyses, and cerebrospinal-fluid examinations. Blood cultures, heterophil antibody, Proteus, and cold agglutination tests were negative, as were agglutination tests for brucellosis, tularemia, typhoid and paratyphoid fevers. Biopsy of enlarged lymph nodes revealed lymphoid hyperplasia.

Mode of Transmission

In every case, there was evidence that the individual had been bitten by ticks, and in some instances the ticks were found clinging to the patient on admission. These ticks were all of the species *Amblyomma americanum*[2]

---

[1] (1) Woodland, J. C., McDowell, M. M., and Richards, J. T.: Bullis Fever (Lone Star Fever—Tick Fever). An Endemic Disease Observed at Brooke General Hospital, Fort Sam Houston, Tex. J.A.M.A. 122: 1156–1160, 21 Aug. 1943. (2) Livesay, H. R., and Pollard, M.: Laboratory Report on a Clinical Syndrome Referred to as "Bullis Fever." Am. J. Trop. Med. 23: 475–479, September 1943.

[2] Bishopp, F. C., and Trembley, H. L.: Distribution and Hosts of Certain North American Ticks. J. Parasitol. 31: 1–54, February 1945.

(the Lone Star tick), which was found by later studies to be the predominant species of 12 species found in the area. None of the other species were known to attach themselves to man, although the rabbit tick (*Haemaphysalis leporis-palustris*), shown by Steinhaus and Parker [3] to harbor a filter-passing agent, was present at Camp Bullis in small numbers.

TABLE 32.—*Comparison of signs, symptoms, and laboratory findings of Bullis fever and infectious mononucleosis*

Signs, symptoms, and laboratory findings	Bullis fever	Infectious mononucleosis
Signs:		
Fever, 3 to 4 days, 103°–104° F	++++	++++.
Multiple tick bites	++++	0.
Lymphadenopathy	++++	++++.
Splenomegaly	+	+++.
Pharyngitis	+	++++.
Rash	+	+.
Jaundice	0	+.
Symptoms and characteristics:		
Incubation period	1–2 weeks	1 to 2 weeks.
Infectious agent	Rickettsia(?)	Virus(?).
Vector	Lone Star tick	Direct contact.
Distribution	South-Central Texas(?)	Worldwide.
Time of year	Summer	Anytime.
Onset	Usually acute	Usually acute.
Chilly sensation	+++	+++.
Headache	++++	++.
Lassitude	+++	+++.
Anorexia	++	++.
Nausea	++	++.
Vomiting	++	++.
Exposure to ticks	++++	
Sore throat	+	++++.
Laboratory findings:		
Leukocyte count	3–7,000	10–30,000.
Lymphocytosis	+++ (relative)	++++ (absolute).
Atypical lymphocytes	++	++++.
Blood cultures	Negative	Negative.
Agglutinins vs. OX–19, OX–2, OX–K, Brucella, tularemia, Para A, Para B, cold agglutinins.	do	Do.
CF antibodies vs. Q fever, Rocky Mountain spotted fever, epidemic typhus, and murine typhus.	do	Do.
Davidsohn heterophil	do	++++.
Wassermann positive	(?)	6 to 40%.

[3] Steinhaus, E. A., and Parker, R. R.: The Isolation of a Filter-passing Agent From the Rabbit Tick *Haemaphysalis leporis-palustris* Packard. Pub. Health Rep. 59: 1958–1959, November 1944.

In view of the ticks or tick bites found in all cases, the theory was advanced that the agent causing the disease was carried by the tick as a vector and by wild or domestic animals as hosts. Transferees from other nearby posts in this same area who had not come in contact with ticks did not show evidence of the disease.

Amblyomma americanum is a small, hard tick which varies considerably in size and also shows an unusual disparity between the smaller males and larger females. It is known to be a three-host tick found in abundance in the States bordering the Gulf of Mexico, as well as along the South Atlantic coast, and in parts of Oklahoma, Arkansas, and Missouri.[4] It is also found in great numbers in Mexico and occasionally in other parts of Central America and in South America (maps 3 and 4).

MAP 3.—General distribution of *Amblyomma americanum* in the Western Hemisphere.

---

[4] Cooley, R. A., and Kohls, G. M.: The Genus *Amblyomma* (*Ixodidae*) in the United States. J. Parasitol. 30: 77–111, April 1944.

MAP 4.—Areas of the United States where *Amblyomma americanum* is known to have been found.

A. americanum is important as a vector of Rocky Mountain spotted fever and of Q fever, as well as of Bullis fever. More complete studies of its prevalence were made, and investigations were initiated to determine effective methods of control.

Case report.[5]—A white soldier, 22 years of age, was admitted to Brooke General Hospital on 25 June 1942, complaining of severe generalized headache of 4 or 5 hours' duration. He appeared to be acutely ill. The onset of the illness was sudden, with nausea, vomiting, and severe headache. He had no prodromal symptoms, and his history was noncontributory. He had been at Camp Bullis, Tex., for 1 week, and had returned to Fort Sam Houston 5 days before the onset of the disease. While at Camp Bullis, he had suffered numerous tick and chigger bites. Physical examination revealed flushed skin, and evidence of numerous insect bites on the abdomen and legs. Moderate lymphadenopathy was found; otherwise, physical examination gave negative results. Laboratory findings were not indicative, hematological studies showed a range of 4,600 to 6,800 leukocytes over a 15-day period, erythrocyte and hemoglobin determinations remained normal throughout, and no malaria plasmodia were found. Urinalyses revealed only a slight trace of albumin during the febrile course of the disease, and the spinal-fluid cell count was normal. Cultures for bacteria and agglutination tests were negative.

The patient's progress in the hospital was rapid, and temperature receded by the 5th day, although general weakness, lassitude, and malaise were noted. He was ambulatory by the 10th day, and completely asymptomatic. There was still generalized glandular enlargement, the only constant physical derangement in this case, which disappeared by the 14th day after admission. Convalescence was complete after 22 days, except for a moderate lymphocytosis.

---

[5] See footnote 1(1), p. 344.

Treatment

Routine nursing and bed care were administered during the acute stage of the disease. Codeine sulfate, with acetyl salicylic acid, was given for relief of the severe headache, the intake of fluids was encouraged, dextrose and saline were given intravenously, and hydrotherapy was employed to combat the febrile reaction. Chemotherapy was used in a few cases but was observed to increase the toxicity of the disease. From clinical observation, it was deduced that the incubation period of this disease was from 3 to 10 days. The disease was self-limited in nature, and varied from a mild febrile illness of short duration, to a severe, debilitating, prolonged disease with a protracted convalescence.

MILITARY EXPERIENCE

At Brooke General Hospital, during the months of May and June 1943, 485 patients with the syndrome were observed, and probably nearly as many had been observed the previous year. Epidemiologically, it appeared that this disease was more severe and more prevalent in 1943 than in 1942.[6] It was postulated that either the agent had increased in virulence by 1943 as a result of repeated passage or the population exposed during 1943 was more susceptible. Camp Bullis had been used before World War II by National Guard troops composed largely of local individuals who perhaps possessed some degree of acquired immunity. Persons acquiring the disease in 1942 and 1943 were, for the most part, residents of relatively tick-free sections of the country, such as the northern part of the Midwest and the North Atlantic coastal regions. During this period, a division was in training at Camp Bullis. The incidence of Bullis fever in persons exposed to infection was about 1 in 30 (approximately 3 percent). During years following the war, cases of the disease continued to occur among military personnel engaged in testing tick repellents and among civilians who were exposed to ticks in this area.

Significance

Although no permanent disability was reported as a result of the disease, its frequent occurrence in individuals at Camp Bullis posed a distinct medical problem, and two known fatalities are attributed to Bullis fever, one in May 1943 [7] and one in May 1946.[8] Bullis fever is not listed as such by the Medical Statistics Division, Office of the Surgeon General of the Army, and breakdown of incidence and incidence rates has not been completed. The actual number of admissions is not known, as only preliminary tabulations have

---

[6] Livesay, H. R., and Pollard, M.: Serological Studies of Bullis Fever. Am. J. Trop. Med. 24: 281–284, September 1944.

[7] See footnote 1(1), p. 344.

[8] Armed Forces Institute of Pathology, Accession No. 182614, Brooke Army Hospital No. A–59–46, May 1946.

been made.[9] Military officials responsible for the health of troops finally decided not to use the area for training during the latter years of the war, despite the many control measures suggested and tested.

Research

The original description of Bullis fever as a clinical entity stimulated research in two fields of investigation. Clinical and laboratory studies were made at Brooke General Hospital,[10] the Eighth Service Command Laboratory (later known as the Fourth Army Area Medical Laboratory), the U.S. Public Health Service Rocky Mountain Laboratory, and the University of Texas Medical Branch, Galveston, Tex.[11] Entomologic studies of methods of tick control were instituted at Camp Bullis by the Bureau of Entomology and Plant Quarantine, U.S. Department of Agriculture,[12] and by the U.S. Army Medical Department, after the Lone Star tick was suspected as the arthropod vector.

At the Eighth Service Command Laboratory, Livesay and Pollard, in 1943, demonstrated that the disease had no immunologic relationship to Rocky Mountain spotted fever and that guinea-pig reaction, *Proteus* agglutinations, and complement-fixation tests indicated that it was not typhus fever. The clinical syndrome and complement-fixation tests also served to separate it from Q fever. They succeeded in passing through guinea pigs a rickettsialike agent (later believed to be a virus), obtained from clinical cases, and in inducing febrile reactions. Rickettsialike bodies were observed in guinea pigs killed during the febrile stage of the disease and in hyperplastic lymph nodes from human patients. During the same year, Anigstein and Bader, at the University of Texas Medical Branch, recovered a rickettsialike organism from ground, filtered suspensions of *Amblyomma americanum* ticks collected at Camp Bullis and later reported on its specificity.

---

[9] The Medical Statistics Division, SGO, advised on 4 December 1952, "except for 1942, * * * admission data have been obtained from sample tabulations of individual medical records. The 1942 data are based on a complete file of records; data for 1943 are based on a 20 percent sample of admissions. All data are to be considered preliminary pending publication of final tabulations * * * Bullis fever was first included in an alphabetical list by the Medical Statistics Division in 1943, but, in that year, Bullis fever was coded to a diagnostic group which also included agranulocytosis and infectious mononucleosis. From 1944–48, under a revised coding system, Bullis fever was coded to a residual category, 'other infectious and parasitic diseases.' Thus, it should be noted that through 1948, no specific code for Bullis fever existed in the coding systems used by the Medical Statistics Division. Beginning with 1949, diagnostic classication and coding were revised, * * * [and] since a card for Bullis fever does not appear in this file, it appears unlikely that, from 1949 to date, medical records have been received with the diagnosis of Bullis fever."

[10] Pollard, M., Livesay, H. R., Wilson, D. J., and Woodland, J. C.: Experimental Studies With Bullis Fever. Am. J. Trop. Med. 26: 175–187, March 1946.

[11] (1) Anigstein, L., and Bader, M. N.: Preliminary Report on Investigations of Bullis Fever. Texas Rep. Biol. & Med. 1: 298, 1943. (2) Anigstein, L., and Bader, M. N.: Investigations on Rickettsial Diseases in Texas. Part 4. Experimental Study of Bullis Fever. Texas Rep. Biol. & Med. 1: 389–409, 1943. (3) Bader, M. N., and Anigstein, L.: Specificity of Bullis Fever Rickettsia. Texas Rep. Biol. & Med. 2: 405–412, 1944. (4) Blair, R. K., and Bader, M. N.: Observations on Experimental Bullis Fever in Man. Texas Rep. Biol. & Med. 3: 105–111, 1945.

[12] Smith, C. N., and King, W. V.: Field Studies of Tick Repellents. Am. J. Trop. Med. 30: 97–102, January 1950.

In further studies, Livesay and Pollard, during 1944, concluded that the Bullis fever syndrome is not characterized by significant *Proteus* OX-19, OX-K, or OX-2 agglutination reactions. They also demonstrated that the complement-fixation test did not reveal a serologic relationship between the agents of Bullis fever and Q fever. At the University of Texas Medical Branch, Blair and Bader, in 1945, demonstrated the infectivity of guinea-pig-propagated strains of Bullis fever for human beings.

Control Measures

During the course of World War II, little was done to control conditions which led to outbreaks of Bullis fever except to close the post for training activities of troops. Attempts were made to destroy ticks on the ground by burning grass around campsites, but few troops were allowed in the area after 1943. Because of the prevalence of Bullis fever, the Air Forces placed the Camp Bullis and Stanley reservations off limits for the training of troops.

POSTWAR RESEARCH

Laboratory Studies

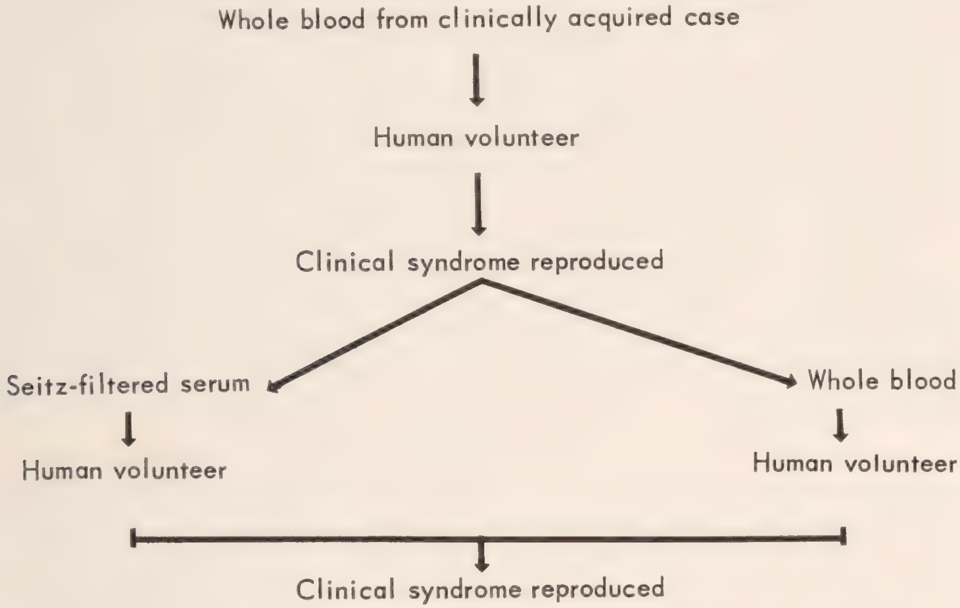
After actual cessation of World War II, many studies were conducted in relation to this disease. In 1946, Pollard, Livesay, Wilson, and Woodland [13] reported their success in reproducing the Bullis fever syndrome in human volunteers by inoculation of whole blood from febrile cases (table 33). In this work, they stated that the size of the agent appeared to be nearer to the size of the elementary body agents such as ornithosis than to that of the typical rickettsiae. On one occasion, they reproduced the syndrome by using the filtrate passed through a Seitz E.K. filter (chart 2). In this instance, all human volunteers had been found previously to be seronegative for murine typhus, Rocky Mountain spotted fever, Q fever, lymphogranuloma venereum, *Proteus* OX-19, *Proteus* OX-2, and heterophil.

TABLE 33.—*Transmission of chick-embryo-propagated Bullis fever agent from a febrile case*

Human volunteer	Generations of passage	Inoculations of yolk-sac emulsion	Clinical syndrome reproduced
No. 1	2 mouse and 4 chick embryo generations.	1 cc.	After 6 days.
No. 2	do	1 cc.	After 4 days.
No. 3	2 mouse and 11 chick embryo generations.	1 cc.	Do.
No. 4	2 mouse and 20 chick embryo generations.	1 cc.	After 3 days.

[13] See footnote 10, p. 349.

CHART 2.—Human whole blood transmission experiments



Pollard and coworkers found that blood-propagated yolk sac strains, after 20 serial transfers, and tick-propagated yolk sac strains, after 12 transfers, reproduced the disease in human beings.

In further studies, they showed that the immunologic responses induced by natural cases of the disease, by the blood-propagated yolk sac strain, and by the tick-propagated yolk sac strain, were the same.

From work done at this time, it was concluded that there was no immunologic relationship between this agent and the agent of Colorado tick fever. Livesay, Wilson, Pollard, and Woodland, in 1946, demonstrated that there is no immunologic relationship between Bullis fever and dengue fever.[14]

Tick Control Studies

As a result of a conference held in May 1946, at Fort Sam Houston, where representatives of the Bureau of Entomology and Plant Quarantine, U.S. Department of Agriculture, and the Office of the Chief of Engineers, U.S. Army, were in attendance, investigations into tick control at Camp Bullis were instigated. An informal report was submitted by the Bureau of Entomology and Plant Quarantine in June 1946 stating that: Large numbers of ticks inhabited thick bushes and the underside of leaves, making control problems difficult; pastured areas did not possess the heavy undergrowth

[14] (1) Livesay, H. R., Wilson, D. J., Pollard, M., and Woodland, J. C.: Experimental Studies of Bullis Fever and Dengue Fever. Am. J. Trop. Med. 26: 379–381, July 1946. (2) Pollard, M., Livesay, H. R., Wilson, D. J., and Woodland, J. C.: Immunological Studies of Dengue Fever and Colorado Tick Fever. Proc. Soc. Exper. Biol. & Med. 61: 396–398, April 1946.

required by ticks; deer were the principal host of ticks; preliminary tests indicated that good (over 95 percent) control of ticks could be obtained by application of DDT in pyrophyllite at the rate of 40 pounds per acre; and power dusters were recommended in lieu of spray because of the thick undergrowth. The report also disclosed that nymph and adult ticks were present in considerable numbers early in May, reaching a peak late in May and the first week in June. The decline was rapid during the next 8 weeks, and activity was practically ended by the middle of October.

Department of Agriculture workers carried out investigations on different insecticides and methods of application, including airplane and ground sprays. Sprays of nicotine, lethane, thanite, and pyrethrin did not prove satisfactory, but mixtures of DDT and benzene hexachloride gave highly effective control for a period of 4 or 5 weeks. An experiment using the tick-infested area as pasturage for cows and periodically eliminating the ticks from their bodies did nothing to reduce the tick population.

In 1947, 20 volunteer soldiers from the Field Medical Service School, Brooke Army Medical Center, under Dr. J. M. Brennan, U.S. Public Health Service, Hamilton, Mont., underwent a series of investigations in which uniforms impregnated with various chemical agents were tested.[15] Numerous chemicals were used, including butylacetanilide, benzyl cyclohexanol, 2-phenylcyclohexanol, benzyl bonzoate, dimethylphthalate, dibutylphthalate, a mixture of the last three, and phthalic acid-hexahydro-di-ethyl ether. Technical assistance and materials were supplied by the U.S. Department of Agriculture. Results of the experiments showed that butylacetanilide afforded complete protection against nymphs and adults, and phenylcyclohexanol provided good protection properties. All others proved to be either ineffective or toxic. Three of these twenty volunteers developed a syndrome identical to that described as Bullis fever. Attempts at human transmissions were unsuccessful.

A similar series of tests was made in 1948 under Drs. Willard V. King and Carroll N. Smith,[16] Department of Agriculture Experiment Station, Orlando, Fla. Among many repellents tested were Indalone, benzyl benzoate, benzobenzoate, dimethyl-carbate, 2-ethyl, 2-butyl, 1,3-propanediol, and n-hexyl mandelate. Of these agents, Indalone appeared to hold the best promise for protection against ticks.

Treatment Studies

As noted in earlier clinical studies, treatment of Bullis fever with chemotherapeutic agents, except for the relief of headache and fever, either in-

---

[15] (1) Brennan, J. M.: Field Investigations Pertinent to Bullis Fever. Texas Rep. Biol. & Med. 3: 112–121 and 204–226, 1945. (2) Brennan, J. M.: Preliminary Reports on Some Organic Materials as Tick Repellents and Toxic Agents. Pub. Health Rep. 62: 1162–1165, August 1947. (3) Brennan, J. M.: Field Tests With Tick Repellents. Pub. Health Rep. 63: 339–346, March 1948.

[16] (1) See footnote 12, p. 349. (2) Smith, C. N., and Burnett, D., Jr.: Laboratory Evaluation of Repellents and Toxicants as Clothing Treatments for Personal Protection From Fleas and Ticks. Am. J. Trop. Med. 28: 599–607, July 1948.

creased the toxicity of the disease or contributed nothing to the welfare of the patient. Penicillin and sulfonamide drugs were used in a number of cases without apparent beneficial effect.

At least one case responded to treatment with PABA (para-aminobenzoic acid), according to a report in 1949 by Arnold and Van Noate.[17] Because of the dramatic response of certain rickettsial diseases (typhus fever and Rocky Mountain spotted fever) to PABA, a patient at Walter Reed Army Hospital, who demonstrated all of the symptoms of Bullis fever, was given a therapeutic trial by oral administration of this drug. A rapid response was accomplished by the return to normal temperature and general clinical improvement within a few hours. Although there appear to be no published data, other cases of Bullis fever are reported to have been successfully treated with PABA, further strengthening the theory that the disease is rickettsial in origin.

SUMMARY

An apparently new clinical entity with fever, lymph node involvement, and evanescent rash, and with absence of sore throat, occurred in 1,000 or more military personnel stationed at Camp Bullis, Tex., during and following World War II. Laboratory findings were negative for known infectious diseases of this area, including infectious mononucleosis, Colorado tick fever, dengue fever, and Rocky Mountain spotted fever.

The disease was attributed to a filterable organism believed to be of the rickettsiae, although differential leukocyte counts were similar to those found in diseases of viral origin. Laboratory workers during the period reported that they were able to isolate causative organisms from emulsions of the tick species *Amblyomma americanum* believed to be the vector of the agent.

A. americanum was found in large numbers in this area as ectoparasites of wild and domestic animals. Control measures tested at Camp Bullis included evaluation of insecticides and tick repellents. Good results were obtained from use of DDT with benzene hexachloride and Indalone respectively.

Successful treatment of the infection has been reported in a few cases by oral administration of PABA, but other chemotherapeutic agents were of no apparent value.

It is evident that this reservation should not be used again by great numbers of troops unless every effort is made to confirm the etiology and the mode of transmission of this disease. However, it is believed that, if investigations were carried out, this syndrome would be discovered in many other areas where *A. americanum* is found in abundance.

---

[17] Arnold, W. T., and Van Noate, H. F.: Bullis Fever: Report of a Case Treated With Para-Aminobenzoic Acid. Bull. U.S. Army M. Dept. 9: 218–223, March 1949.

CHAPTER XIII

Infectious Mononucleosis

Alfred S. Evans, M.D., and John R. Paul, M.D.

Infectious mononucleosis was a common and usually benign disease during World War II, behaving, on the whole, as an endemic and sporadic illness with two possible exceptions. No sharp epidemics were recorded. Mortality due to this disease was very low but not unknown. The period of hospitalization was usually about 26 days, but in certain patients, especially those with liver or central nervous system involvement, it was much longer. The etiological agent and specific methods of prophylaxis and treatment remain unknown. Nevertheless, as this disease is one of young adulthood with its highest incidence in the 15- to 25-year age group, it has some significance for the Army medical officer.

HISTORICAL NOTE

At the outbreak of World War I, infectious mononucleosis, or glandular fever, as it then was called, was a poorly recognized disease and no specific hematological or serologic changes were known to be associated with it. Only a few accounts had appeared in the American literature up to this time, but notable among them was the report by West,[1] in 1896, of an outbreak of the disease involving a large number of adults and children in an Ohio community. Later, others called attention to its occurrence in epidemic form in institutions.[2]

Little is recorded of the experience of U.S. Army troops with this condition during World War I. It is not mentioned in the official history of the Army Medical Department during that conflict, but some of the case reports recorded under the diagnosis of Vincent's infection are suggestive of infectious mononucleosis. The illness was better known in England where outbreaks of the disease were not infrequent in British Army camps and barracks, according to Burnford,[3] although these outbreaks are not discussed in the official British history of the war. It seems possible that similar, though unrecognized, outbreaks may have occurred among U.S. troops and been recorded under some other disease.

---

[1] West, J. P.: An Epidemic of Glandular Fever. Arch. Pediat. 13: 889–900, January-December 1896.

[2] (1) Terflinger, F. W.: Epidemic of Glandular Fever. J.A.M.A. 50: 765, 1908. (2) Burns, J. E.: Glandular Fever: Report of an Epidemic in the Children's Ward of the Union Protestant Infirmary. Arch. Int. Med. 4: 118, 1909.

[3] Burnford, J.: A Note on Epidemics. Brit. M.J. 2: 50–51, July 1918.

DEVELOPMENTS BETWEEN WORLD WAR I AND WORLD WAR II

In the 20 years following World War I, two important discoveries were made relating to the diagnosis of infectious mononucleosis. The first of these was the recognition, in the early 1920's, of the characteristic blood picture associated with the disease; [4] the second, the discovery by Paul and Bunnell,[5] in 1932, of the development during convalescence of a high titer of sheep RBC (red blood count) agglutinins. The term "infectious mononucleosis" was introduced into this country soon after the end of World War I and is in general use today, although in England the older term "glandular fever" has remained popular. Reports of epidemics continued to appear from time to time. Among these are publications dealing with small outbreaks in nurseries [6] and boarding schools [7] and a larger outbreak involving 87 individuals in a community on the Falkland Islands.[8] In 1935, Nolan discussed the occurrence of infectious mononucleosis in 220 individuals, including 115 children, at the U.S. Naval Base, Coronado, Calif.[9] The disease has become of considerable importance among university populations in this country where it may account each year for an appreciable amount of illness among the students.

The etiological agent, method of spread, and specific treatment remained unknown.

HISTORY OF THE DISEASE, 1940–46

General Incidence

Before dealing with the occurrence of infectious mononucleosis in U.S. troops, some statements should be made concerning the data on which the tables are based. This disease was grossly underreported on weekly summary reports because reporting of it was not specifically required on the statistical health report. As a consequence, the hospital admission rates based on examination of individual medical records provide the only available source of information, and this must be regarded as provisional. From 1940

[4] (1) Sprunt, T. P., and Evans, F. A.: Mononuclear Leucocytosis in Reaction to Acute Infections (Infectious Mononucleosis). Bull. Johns Hopkins Hosp. 31: 410, 1920. (2) Longcope, W. T.: Infectious Mononucleosis (Glandular Fever) With a Report of 10 Cases. Am. J.M. Sc. 164: 781, 1922. (3) Downey, N., and McKinley, C. A.: Acute Lymphadenosis Compared With Acute Lymphatic Leukemia. Arch. Int. Med. 32: 82, 1923.

[5] Paul, J. R., and Bunnell, W. W.: The Presence of Heterophile Antibodies in Infectious Mononucleosis. Am. J.M. Sc. 183: 90–104, January 1932.

[6] Davis, C. M.: Acute Glandular Fever of Pfeiffer: Report of a Nursery Epidemic. J.A.M.A. 92: 1417–1418, April 1929.

[7] (1) Tidy, H. L., and Daniel, M. B.: Glandular Fever and Infectious Mononucleosis With an Account of an Epidemic. Lancet 2: 9, 1923. (2) Guthrie, C. C., and Pessel, J. F.: An Epidemic of "Glandular Fever" in a Preparatory School for Boys. Am. J. Dis. Child. 29: 492, 1925.

[8] Moir, J. I.: Glandular Fever in the Falkland Islands. Brit. M.J. 2: 822–823, November 1930.

[9] Nolan, R. A.: Report of So-Called Epidemic of Glandular Fever (Infectious Mononucleosis). U.S. Nav. M. Bull. 33: 479–483, October 1935.

through 1943, the data also included patients with agranulocytosis since these two diseases were recorded under a similar heading. The effect on the total rate of the inclusion of agranulocytosis is probably small since in 1944 it accounted for only one-half of one percent of the combined incidence for both diseases. The increase in the number of admissions in 1943, however, may have been due in some measure to admission for Bullis fever.

The admission rates per thousand average strength per year in the U.S. Army as a whole, in troops stationed in the United States, and in troops in oversea areas for the years 1940 to 1946, inclusive, are indicated in table 34. As can be seen, the admission rate, both as a whole and for the subdivisions shown, rose gradually and steadily during these years. The incidence for the total Army for 1946 was over 16 times greater than that recorded in 1940. The rate for troops stationed in the United States declined in 1946. It will also be noted that the increase in troops in oversea areas lagged a year or so behind that of men stationed in the United States.

TABLE 34.—*Admission rates for infectious mononucleosis in the U.S. Army by broad geographic area and year, 1940–46* [1]

Rate expressed as number per annum per 1,000 average strength]

Year	Total Army	United States	Overseas
1940	0.09	0.11	0.05
1941	.19	.17	.10
1942	.28	.29	.23
1943	.60	.69	.34
1944	.83	1.22	.41
1945	1.01	1.71	.58
1946	1.57	1.52	1.64

[1] Rates for 1940 and 1941 are for enlisted men only; rates for 1940, 1941, 1942, and 1943 may include a few cases of agranulocytosis and for 1943 several hundred cases of Bullis fever.

Table 35 shows the admission rates per thousand per year in the U.S. Army in the various theaters and areas. From 1943 until 1946, the rate in troops stationed in the United States somewhat exceeded that recorded for troops in any other area with the exception of the 1943 rate in Europe. However, in 1946, three other areas had more hospital admissions diagnosed as infectious mononucleosis than had the Zone of Interior. These areas were: Mediterranean-Middle East, Japan-Korea, and Europe. Despite such differences during 1946 as well as in earlier years, it should be noted that there was no consistent marked variation from area to area and that no single area appeared remarkable in this regard. A similar distribution of cases was observed in different Army sections of the United States (table 36).

TABLE 35.—*Admission rates for infectious mononucleosis in the U.S. Army by theater or area and year, 1942–46*

[Rate expressed as number per annum per 1,000 average strength]

Theater or area	1942 [1]	1943 [1]	1944	1945	1946
Continental United States	0. 29	[2] 0. 69	1. 22	1. 71	1. 52
Overseas:					
Europe	. 43	. 72	. 59	. 78	2. 20
Mediterranean [3]	. 17	. 32	. 25	. 51	--------
Middle East	. 17	. 34	. 19	. 37	--------
China-Burma-India	. 46	. 61	. 18	. 27	. 56
Southwest Pacific	. 39	. 25	. 21	. 23	. 55
Pacific Ocean	. 23	. 22	. 28	. 59	1. 08
North America	. 10	. 19	. 28	. 66	. 50
Latin America	. 18	. 36	1. 20	. 34	. 94
Japan and Korea	--------	--------	--------	--------	2. 31

[1] Data for 1942 and 1943 may include a few cases of agranulocytosis.
[2] May include several hundred cases of Bullis fever.
[3] Includes North Africa.

TABLE 36.—*Admissions for infectious mononucleosis in the U.S. Army, by Army Area in the United States, 1945 and 1946*

[Rate expressed as number per annum per 1,000 average strength]

Army Area	1945		1946	
	Number	Rate	Number	Rate
First	390	1. 33	230	1. 49
Second [1]	510	1. 23	445	1. 74
Third	1, 075	1. 56	265	1. 23
Fourth	1, 235	1. 93	355	1. 76
Fifth	1, 125	2. 64	265	1. 59
Sixth	665	1. 32	255	1. 23
Total	5, 000	1. 71	1, 815	1. 52

[1] Includes Military District of Washington.

Individual Outbreaks

It would seem probable that an illness like infectious mononucleosis, which had the capacity to appear in epidemic form, would have done so under the circumstances of Army life. It appears remarkable, therefore, that only two reports [10] can be found which suggest occurrence of the disease in epidemic form. The first of these was the publication of Vander Meer, Lutterloh, and Pilot from the station hospital at Camp McCoy, Wis.[11] These authors observed 26 clinical and 340 subclinical cases of infectious mononucleosis from December 1943 to May 1944. The diagnosis of a subclinical attack was based on the results of a survey of 522 apparently healthy men in one training unit and 110 hospitalized patients with illnesses diagnosed as other illnesses. Atypical lymphocytes alone were found in the blood smears of 340 of the total number of men, and, in addition, an elevated heterophile antibody titer was demonstrated in 13. None of these men had a history of an acute illness suggestive of infectious mononucleosis in the 6 months preceding the survey.

The second account suggestive of the occurrence of an epidemic form of infectious mononucleosis is the extensively documented publication of Wechsler, Rosenblum, and Sills from the medical service, station hospital at Fort Bliss, Tex.[12] These authors studied 556 patients with infectious mononucleosis from 1 January 1943 to 29 February 1944. An additional 131 cases had been admitted by July 1944, but clinical details on these patients were not included in their report. Unfortunately, neither the admission nor the incidence rates per 1,000 per year are recorded. Consequently, it is not possible to compare the incidence at Fort Bliss with that at other installations or with the incidence in the Army as a whole. The ages of the patients ranged from 18 to 47 years, but the greatest frequency

---

[10] A third outbreak of a disease with some of the features of infectious mononucleosis has been recorded. (Professional History of Internal Medicine in World War II, 1 Jan. 1940 to 1 Oct. 1945, the Panama Canal Department. Special Disease Problems, Various Diseases, vol. I, pp. 26–42. [Official record.] This occurred in the Canal Zone in the fall of 1944 during which time 91 cases were admitted to the 368th Station Hospital and the 262d General Hospital. High fever, generalized lymphadenopathy, splenomegaly, and lymphocytosis were present in the majority of the cases; atypical lymphocytes were found in some of the blood smears, and a few lymph nodes examined were said to be compatible with the diagnosis of infectious mononucleosis. A number of atypical features were noted, however. These included the occurrence of bronchopneumonia in 16.7 percent of the patients, a rash in 46.7 percent, and a normal or slightly elevated heterophile antibody titer in the serum of most of the patients. This titer never exceeded 1 : 224 in any serum, and serum from only 16 patients had titers of 1 : 112, or higher. Elevated Weil-Felix and cold-agglutinin titers and false-positive tests for syphilis were not infrequently encountered. Because of these unusual features, this outbreak has not been included as an unequivocal instance of an epidemic of infectious mononucleosis. Postwar experience has seemed to indicate that one or more "dengue-like diseases" exist in Panama, of which this may have been an example.

[11] Vander Meer, R., Lutterloh, C. H., and Pilot, J.: Infectious Mononucleosis. An Analysis of 26 Clinical and 340 Subclinical Cases. Am. J.M. Sc. 210: 765–774, December 1945.

[12] Wechsler, H. F., Rosenblum, A. H., and Sills, C. T.: Infectious Mononucleosis; Report of an Epidemic in an Army Post. Ann. Int. Med. 25: 113, July 1946, and 236, August 1946.

occurred in the 18- to 20-year group. Every organization present had one or more cases, and 21 organizations contributed 10 or more patients each. Epidemiological surveys were not carried out. This report detailed the many clinical forms that infectious mononucleosis may take and gave special emphasis to the hepatic, pneumonic, and meningitic symptoms which had not been widely appreciated before this study.

Military Significance

From the data available, it appears that infectious mononucleosis was a fairly common illness among U.S. troops in all theaters but that it rarely assumed epidemic proportions. Nevertheless, the possibility that it might produce widespread outbreaks at some time in the future should be borne in mind. Only nine deaths attributable to the disease or its complications were reported in U.S. soldiers.[13] Although usually benign, the disease required hospitalization for an average of 26 days and occasionally for much longer, especially in the icteric forms of the disease.

Control Measures

No specific control measures were taken with respect to infectious mononucleosis, and the general experience with the disease suggests that none were necessary. Patients were often hospitalized on open wards without evidence of cross infections,[14] and even aboard ships secondary cases were apparently very uncommon.[15] In civilian colleges and universities also, infectious mononucleosis seems to have a low index of contagiousness.[16]

Research

Attempts to study the nature of the etiological agent of the disease by transmission to experimental animals have been unsuccessful. Experiments with human volunteers, in this country under the direction of the Commission on Virus and Rickettsial Diseases of the Army Epidemiological Board, and experiments conducted abroad have given only suggestive results.

The property of serum from some cases to agglutinate human red cells modified by treatment with Newcastle disease virus, an agent responsible for

---

[13] Custer, R. P., and Smith, E. B.: The Pathology of Infectious Mononucleosis. Blood 3: 830–857, August 1948.

[14] Mitchell, R. H., and Zetzel, L. P.: Infectious Mononucleosis in the Army. War Med. 5: 356–360, June 1941.

[15] Paul, O.: Mononucleosis on Board a Destroyer. U.S. Nav. M. Bull. 44: 614–617, March 1945.

[16] (1) Houser, K. M.: Infectious Mononucleosis. Pennsylvania M.J. 46: 1173–1174, August 1943. (2) Contratto, A. W.: Infectious Mononucleosis: A Study of One Hundred and Ninety-Six Cases. Arch. Int. Med. 73: 449–459, June 1944. (3) Milne, J.: Infectious Mononucleosis. New England J. Med. 233: 727–731, December 1945. (4) Evans, A. S., and Robinson, E. D.: An Epidemiologic Study of Infectious Mononucleosis in a New England College. New England J. Med. 242: 492–496, March 1950.

a disease in chickens, was discovered by Burnet and Anderson [17] in Australia and later was confirmed in this country.[18] Newcastle disease virus appears unrelated to the hypothetical agent of infectious mononucleosis. Wider appreciation of the clinical forms of infectious mononucleosis was gained during the war, especially through excellent studies like that of Wechsler, Rosenblum, and Sills. Splenic rupture was recognized as a rare but occasionally fatal complication. Involvement of the liver even in nonjaundiced cases was first reported by Cohn and Lidman from the Boca Raton Army Airfield, Fla.,[19] and has been confirmed and reported by other investigators. Histological proof of such hepatic lesions in the jaundiced patients was reported by Kilham and Steigman [20] from the Harvard unit in England, as well as by Bang and Wanscher.[21] Similar, though less definite, involvement in the nonjaundiced cases was noted in punch biopsies studied by Van Beek and Haex,[22] and by Davis, MacFee, Wright, and Allyn.[23] The occasional occurrence of meningitic and encephalitic forms of infectious mononucleosis was emphasized in several reports appearing during, or shortly after, the war.[24] The pathology of the disease was carefully investigated by Custer and Smith of the Armed Forces Institute of Pathology on the basis of nine fatal cases of infectious mononucleosis,[25] which perhaps represent the largest series of fatal cases ever assembled in one group. It was emphasized that lymphocytic infiltrates may occur in almost any organ and may account for the widely different clinical patterns which occur. Penicillin, the sulfonamides, and streptomycin were found generally ineffective in the treatment of the disease, except in preventing and eradicating secondary bacterial invaders.

---

[17] Burnet, F. M., and Anderson, S. G.: Modification of Human Red Cells by Virus Action. II. Agglutinization of Modified Human Cells by Sera From Cases of Infectious Mononucleosis. Brit. J. Exper. Path. 27: 236–244, August 1946.

[18] (1) Evans, A. S., and Curnen, E. C.: Serological Studies on Infectious Mononucleosis and Other Conditions With Human Erythrocytes Modified by Newcastle Disease Virus. J. Immunol. 58: 323–335, March 1948. (2) Florman, A. L.: The Agglutination of Human Erythrocytes Modified by Treatment With Newcastle Disease and Influenza Virus. J. Bact. 57: 31–38, January 1949.

[19] Cohn, C., and Lidman, B. I.: Hepatitis Without Jaundice in Infectious Mononucleosis. J. Clin. Investigation 25: 145–151, January 1946.

[20] Kilham, L., and Steigman, A. J.: Infectious Mononucleosis. Lancet 2: 452–454, October 1942.

[21] Bang, J., and Wanscher, O.: The Histopathology of the Liver in Infectious Mononucleosis Complicated by Jaundice, Investigated by Aspiration-Biopsy. Acta med. scandinav. 120: 437–446, 1945.

[22] Van Beek, C., and Haex, A. J. C.: Aspiration-Biopsy of the Liver in Mononucleosis Infectiosa and in Besnier-Boeck-Schaumann's Disease. Acta med. scandinav. 113: 125–134, 1943.

[23] Davis, J. S., MacFee, W., Wright, M., and Allyn, R.: Rupture of the Spleen in Infectious Mononucleosis. Lancet 2: 72–73, July 1945.

[24] (1) Thelander, H. E., and Shaw, E. B.: Infectious Mononucleosis, With Special Reference to Cerebral Complications. Am. J. Dis. Child. 61: 1131–1145, June 1941. (2) Coogan, T. J., Martinson, D. L., and Mathews, W. H.: Neurological Symptoms of Infectious Mononucleosis. Illinois M.J. 87: 296–302, June 1945. (3) Peters, C. H., Widerman, A., Blumberg, A., and Ricker, W. A., Jr.: Neurologic Manifestations of Infectious Mononucleosis; With Special Reference to the Guillain-Barre Syndrome. Arch. Int. Med. 80: 366–373, September 1947. (4) Field, W. W.: Infectious Mononucleosis With Severe Central Nervous System Involvement. Am. J. Med. 4: 154–157, January 1948. (5) Dolgopol, V. B., and Husson, G. S.: Infectious Mononucleosis With Neurologic Complications: Report of a Fatal Case. Arch. Int. Med. 83: 179–196, February 1949.

[25] See footnote 13, p. 360.

559625v—61——25

CHAPTER XIV

Lymphocytic Choriomeningitis

Aaron F. Rasmussen, Jr., M.D., and Joseph E. Smadel, M.D.

In World War II, lymphocytic choriomeningitis was a relatively uncommon disease and there were only 33 proved cases of infection with the virus of this disease. During the years 1943 to 1945, inclusive, a total of 758 admissions for this disease were reported on the basis of clinical evidence. However, in a series of 276 cases studied carefully at the Army Medical Department Research and Graduate School, Army Medical Center, Washington, D.C., infection with the virus of lymphocytic choriomeningitis was proved in only 31 instances. Thus, in this study, the virus of this disease was of etiological significance in only about 10 percent of the cases which had been given a final clinical diagnosis of lymphocytic choriomeningitis.

RECENT DESCRIPTION

Major developments in the knowledge of lymphocytic choriomeningitis are all of comparatively recent origin. The years immediately preceding and following World War II witnessed fundamental changes in the popular conception of this disease. In 1925, Wallgren [1] first attempted to differentiate benign, nonbacterial lymphocytic meningitis from the acute bacterial and mycotic meningitides as well as from those viral infections characterized by primary damage to nervous tissue rather than to the meninges. In 1933 Armstrong [2] discovered the virus of lymphocytic choriomeningitis, and in 1934 Rivers and Scott [3] found this virus to be the cause of human infections with the typical picture of Wallgren's aseptic meningitis. The virus was found to be widely distributed in mice and other animals, and most human infections were related to contact either with wild mice or with mice or other animals in the laboratory.[4]

The conception of this disease as a clinico-etiological entity was rather generally accepted for the next 5 years. By 1942, it was apparent that

[1] Wallgren, A.: Une nouvelle maladie infectieuse du systeme nerveux central? Acta paediat. 4: 158–182, 1925.

[2] Armstrong, C., and Lillie, R. D.: Experimental Lymphocytic Choriomeningitis of Monkeys and Mice Produced by a Virus Encountered in Studies of the 1933 St. Louis Encephalitis Epidemic. Pub. Health Rep. 49: 1019–1027, 31 Aug. 1934.

[3] Rivers, T. M., and Scott, T. F. M.: Meningitis in Man Caused by a Filterable Virus. Science 81: 439–440, 3 May 1935.

[4] Armstrong, C.: Studies on Choriomeningitis and Poliomyelitis. Bull. New York Acad. Med. 17: 295–318, April 1941.

lymphocytic choriomeningitis virus was not the etiological agent in all cases of aseptic meningitis, and, further, that infections with this virus in man could assume a variety of forms.[5] These facts were not generally realized, however, and as late as June 1942 acute aseptic meningitis was listed as a synonym for lymphocytic choriomeningitis in Standard Nomenclature of Disease and Standard Nomenclature of Operations,[6] published by the American Medical Association. The Office of the Surgeon General followed this nomenclature and, from 1943 to 1945, listed choriomeningitis, lymphocytic, acute or chronic, as a specific infection. At the same time, it was realized that accurate differential diagnosis on a clinical basis was not possible, and the Office of the Surgeon General issued a circular letter[7] which urged that materials from all cases of suspected viral infection of the central nervous system be submitted to the Virus Laboratory at the Army Medical School, Army Medical Center, Washington, D.C., or later to the appropriate medical general laboratory, for special studies.

Thus, for the first time, all the available procedures for the diagnosis of viral infections of the central nervous system were applied to a large number of cases occurring in a variety of geographic locations all over the world. Most of these procedures had previously been employed, in limited studies on selected materials, only in the laboratories in which they had been developed. The results of the Army's experience were of great interest because they indicated the relative infrequency with which the virus of lymphocytic choriomeningitis caused the clinical syndrome with which it had originally been associated.

INCIDENCE

Cases determined by laboratory diagnosis.—The two methods employed for the laboratory diagnosis of lymphocytic choriomeningitis were (1) isolation and identification of the virus and (2) demonstration of the appearance, or rising titer, of the specific complement-fixing or neutralizing antibodies of lymphocytic choriomeningitis.

During the entire war period, specimens were studied at the Army Medical School, Army Medical Center, from over 500 patients with clinical findings suggesting this disease, and sufficient materials for adequate investigative studies were obtained from 276 of these. Thirty-one cases of lymphocytic choriomeningitis were found among the 276. Each of these was diagnosed on the basis of positive results obtained by one or more of the diagnostic methods. Thirty of these were from the United States, and one

[5] Smadel, J. E., Green, R. H., Paltauf, R. M., and Gonzales, T. A.: Lymphocytic Choriomeningitis: Two Human Fatalities Following an Unusual Febrile Illness. Proc. Soc. Exper. Biol. & Med. 49: 683–686, April 1942.

[6] The fourth edition of this work, published in January 1952, contains the same listing.

[7] Circular Letter No. 74, Office of the Surgeon General, U.S. Army, 19 Mar. 1943, subject: Neurotropic Virus Diseases.

was from the Pacific. Two additional cases from the European theater were diagnosed in the 1st Medical General Laboratory.

Occasionally, infections with lymphocytic choriomeningitis virus are of a severe nature. Two fatal cases, proved by the recovery of the virus from tissues of the central nervous system, occurred in the Army. Both patients (Armed Forces Institute of Pathology Accession Nos. 82,126 and 82,722) showed symptoms of encephalitis and were found at autopsy to have an extensive, diffuse, nonsuppurative encephalomyelitis.

Cases diagnosed clinically.—Clinical criteria for diagnosis of this disease were essentially those outlined for aseptic meningitis. These criteria include the following: An acute onset, headache, stiff neck, and other signs and symptoms of meningeal irritation; a lymphocytic pleocytosis; and the exclusion of pathogenic bacteria and higher organisms by bacteriological examination of the spinal fluid.

During the years 1943 to 1945, in which lymphocytic choriomeningitis was accepted as a final clinical diagnosis, 758 admissions for this disease were reported in the Army (table 37).

TABLE 37.—*Admissions for lymphocytic choriomeningitis in the U.S. Army by theater or area and year, 1943–45*

Theater or area	1943	1944	1945
Continental United States	95	98	140
Overseas:			
Mediterranean [1]	63	44	60
Europe	--------	10	115
Pacific	5	14	40
Other areas [2]	14	15	45
Total	177	181	400

[1] Includes North Africa.

[2] Includes the Middle East, China-Burma-India Theater, North America (Alaska and Iceland), and Latin America.

On the basis of the careful studies in the laboratory in which 31 of 276 cases were proved to be caused by lymphocytic choriomeningitis, it is probable that 1 in 10 of the total number of 758 admissions was actually caused by the virus of this disease. The overall incidence for the war years can be estimated at about 76 cases plus the few cases occurring in 1942 before the disease was reportable on clinical grounds.

ETIOLOGY OF ASEPTIC MENINGITIS NOT CAUSED BY THE VIRUS OF LYMPHOCYTIC CHORIOMENINGITIS

The etiology in the remaining cases is a subject of great interest. Serums from this group of patients were tested for the complement-fixing

antibodies of mumps,[8] and about 1 in 8 cases was shown to have been caused by that virus, even though other signs of mumps infection were absent. This still leaves three-fourths of the total group undiagnosed. It is reasonable to assume that abortive infections with a number of other neurotropic viruses might result in a febrile illness and a meningeal reaction. Selected serums from patients in this aseptic meningitis group were tested for the antibodies of St. Louis encephalitis, western equine encephalitis, eastern equine encephalitis, Japanese or type B encephalitis, Russian encephalitis, West Nile encephalitis, and Hawaiian dengue and also for the antibodies of the psittacosis-lymphogranuloma venereum group. In no instance were significant data obtained. Some of these cases probably were abortive poliomyelitis for which no practical test is available.

Postwar developments have shown that the virus of encephalomyocarditis caused an isolated outbreak of disease with similar features in the Philippines,[9] and it is known that the Coxsackie or "C" virus [10] can cause a significant number of such cases. Leptospirosis may also present a similar picture.

---

[8] Rasmussen, A. F., Jr.: The Laboratory Diagnosis of Lymphocytic Choriomeningitis and Mumps. Rocky Mountain Conference on Infantile Paralysis, Denver, Colo., 1946, pp. 45–60.

[9] Smadel, J. E., and Warren, J.: The Virus of Encephalomyocarditis and Its Apparent Causation of Disease in Man. J. Clin. Investigation 26: 1197, November 1947.

[10] Curnen, E. C.: Human Disease Associated With the Coxsackie Viruses. Bull. New York Acad. Med. 26: 335–342, May 1950.

CHAPTER XV

Poliomyelitis

Albert B. Sabin, M.D.

In the United States, the interest of military medicine in poliomyelitis is not related to the relatively small number of individuals of Army age who are rendered noneffective by this disease, although it is noteworthy that residuals of poliomyelitis have been responsible for rejection of nearly one percent of the men found unfit for military duty by induction boards during World War II.[1] However, poliomyelitis presents special problems not only to the medical officers who are concerned with the management of patients but also to those who are concerned with the public health measures and morale of military installations. Since other infectious diseases of human origin which occur predominantly in childhood are special problems during periods of mobilization when millions of young men are brought together from different surroundings into a life of intimate association, the military epidemiologist is naturally concerned with the behavior of poliomyelitis under these conditions. During World War II, large numbers of Americans were thrown into contact with populations living under primitive sanitary conditions, which often deteriorated still further under the effects of combat, and the appearance of poliomyelitis under these circumstances presented intriguing questions to the military epidemiologist and unexpected problems to medical installations in far-off places.

HISTORICAL NOTE

World War I.—During the period 1917–19, poliomyelitis in the United States was still predominantly, if not exclusively, a disease of early childhood. The number of individuals of Army age affected by poliomyelitis during epidemics of the disease was of a very low order. Among enlisted men in the United States and Europe, during the period 1 April 1917–31 December 1919, there were 81 cases of poliomyelitis, and it is noteworthy that the incidence rate was approximately 2 per year per 100,000 average strength, for an average strength of 1,346,615. There were no admissions among officers and probably very few, if any, secondary diagnoses of poliomyelitis other than those among enlisted personnel in the United States and Europe during the period.

[1] Letter, Maj. Gen. Norman T. Kirk, The Surgeon General, to Basil O'Connor, President, National Foundation for Infantile Paralysis, 16 Dec. 1944.

This low incidence suggested that poliomyelitis did not behave like the other diseases of childhood such as measles and mumps, which frequently appear in epidemic form among new recruits. While it was thus evident that poliomyelitis behaved differently from the diseases of childhood, which are known to be transmitted by droplet infection, it was not clear whether a different mode of viral dissemination or an inherent resistance of individuals of Army age was the responsible factor. There were 5 deaths among the 81 enlisted men in the United States and Europe who incurred the disease, yielding a case fatality rate of only 6.17 percent, a figure which makes an interesting comparison with the "virulence" of certain outbreaks during World War II.

Period between the World Wars.—The number of cases listed in the Annual Reports of The Surgeon General, U.S. Army, during the period 1920–41 are shown in table 38. It is of interest to examine separately the data for the troops in the continental United States and those for troops stationed overseas. In the continental United States, the attack rate for any one year did not exceed 3 per 100,000, and there were some years in which no cases of poliomyelitis were recorded. The mean annual attack rate for the 5-year period 1935–39 is 1.4 per 100,000, which is not significantly different from that observed in the much larger numbers of individuals during World War I. Furthermore, the 4 cases of poliomyelitis which occurred during this 5-year period in U.S. troops overseas were distributed as follows: 2 in the Philippine Islands (1936, 1939); 1 in China (1937); and 1 in Hawaii (1939).

Observations in the Philippine Islands.—Of particular interest to military preventive medicine, especially in view of what happened subsequently during World War II in the Philippine Islands, is an account by Lt. Col. (later Brig. Gen.) Charles C. Hillman, MC,[2] of an outbreak which occurred in 1934. Seventeen cases of poliomyelitis were admitted to the Sternberg General Hospital, Manila, Philippine Islands, in 1934. Of the 17 cases, 3 (the 3 recorded in the 1935 Annual Report of The Surgeon General) were in military personnel and the remaining 14 were in dependents of military personnel. Colonel Hillman noted that a very interesting feature of the disease was its social and racial distribution in the Philippine Islands. He stressed that all of the 17 patients had enjoyed superior environmental and nutritional advantages. The 3 military cases were among enlisted men, but 2 of these cases were in noncommissioned officers. Of the 14 cases among dependents, 12 occurred in families of officers and 2 in families of noncommissioned officers. One of the patients was the infant daughter of a Philippine Scout officer; otherwise, all were Americans. None of them were recent arrivals from the United States. Two of the cases occurred in the families of medical officers on duty in Manila, one case in the wife of a ward officer who attended most of the patients with poliomyelitis at the Sternberg General Hospital. Except for two cases that came from Nichols

---

[2] Hillman, C. C.: Poliomyelitis in the Philippine Islands. Mil. Surgeon 79: 48–58, July 1936.

Field, the number of admissions from Fort McKinley and the number from the post at Manila were about equal. Aside from the two cases which occurred in the medical officers' families, there was no known direct or indirect contact between the cases. One group of four cases which occurred in succession in another officer's family may have acquired the infection from a common source.

TABLE 38.—*Incidence (total cases) of poliomyelitis in the U.S. Army, by area and year, 1920–41*

[Rate expressed as number of cases per annum per 1,000 average strength]

Year of admission	Total Army		United States[1]		Overseas	
	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate
1920						
1921	2	0.01	1	0.01	1	0.02
1922	1	.01			1	.03
1923						
1924	[2] 2	.01	[3] 1	[3] .01		
1925						
1926						
1927	2	.02	2	.02		
1928						
1929	2	.01	1	.01	1	.03
1930	1	.01	1	.01		
1931	2	.01	1	.01	1	.03
1932						
1933	1	.01	1	.01		
1934	5	.04	2	.02	3	.08
1935	3	.02	3	.03		
1936	1	.01			1	.02
1937	1	.01			1	.02
1938	3	.02	3	.02		
1939	4	.02	2	.01	2	.04
1940	8	.02	5	.02	3	.04
1941	45	.03	39	.03	6	.05

[1] Includes Alaska.
[2] Includes 1 officer with area of admission not stated.
[3] Among enlisted personnel only.

In addition to these cases of poliomyelitis which occurred in military personnel or their dependents, 12 other cases of poliomyelitis were reported to the Philippine Health Department during 1934 from the whole Philippine Archipelago. Nine of these were reported from the civilian population of Manila and three from the neighboring provinces of Laguna and Rizal. It is of interest to quote from Hillman's communication:

Of the 12 civilian cases, four were Americans (in three families), one was a mestizo, and seven were Filipinos. Considering the vast preponderance of native to American born it will be observed that the incidence rate, even in the civilian population, was

much greater for Americans than for Filipinos. The epidemiological factors that account for this relatively high incidence among Americans, at three separate military stations and in the civilian population, remain a mystery.

With the more limited knowledge of the human disease which obtained in 1934, Colonel Hillman did not even consider the possibility that inapparently infected Filipino domestic servants might have been responsible for bringing the infection to the families of the American officers and the civilians. His speculations, however, included the following: "Assuming that the intestinal tract is the usual portal of entry of the virus into the system, the high incidence and scattered distribution of cases among officers' families, may logically be attributed to some infected food product imported from the States and used largely by commissioned personnel." This speculation is of interest because, during World War II, there were also those who initially were inclined to attribute the unexpected number of cases of poliomyelitis among American personnel in the Philippine Islands to importation of the virus from the United States.

KNOWLEDGE OF THE DISEASE AND CONTROL MEASURES

The year 1939 perhaps marks the end of a decade during which the predominant concept of the nature of human poliomyelitis was that the infection entered and left by way of the nose. It was believed, on the basis of animal experiments, that from the nose the virus entered the central nervous system by way of the olfactory mucosa and pathways to produce the ultimate changes in the central nervous system which gave rise to the characteristic manifestations of the disease. According to this view, droplets emanating from the noses of people with the infection constituted the chief source of the infectious agent. When the methods of chemical prophylaxis, which proved so successful in the prevention of the experimental poliomyelitis in monkeys resulting from nasal instillation of the virus, were found to be without effect in human beings, considerable doubt arose that this was indeed the mode of infection occurring in human beings.

Subsequently, it was demonstrated that the feces of patients with either paralytic or nonparalytic poliomyelitis constituted a rich source of the virus; that both the virus and the lesions which were so constantly present in the olfactory bulbs of monkeys and chimpanzees infected by the nasal route were absent in the olfactory bulbs of human poliomyelitis patients; that the whole alimentary tract including the throat was indeed a place where the virus was present not only in the contents but also in the washed tissues; and that under controlled conditions the virus was regularly absent from the nasal mucosa, salivary glands, and saliva. All these observations led to the consideration of the alimentary tract as an important system as regards both entry and exit of the virus. This concept was strengthened by the demonstration that with certain strains of the virus of recent human origin it was possible to produce poliomyelitis in cynomolgus monkeys as well as in

chimpanzees by feeding the virus under conditions which definitely eliminated infection by the olfactory pathway. As a further natural consequence of these developments, it was found that the filth flies were abundantly contaminated with virus not only when they were trapped near privies in rural areas but also during epidemic periods in cities in regions where no open privies were in evidence. Thus, it became obvious that, while the relative importance of different modes of infection might vary under different conditions, it was necessary to consider all of the various ways by which human excreta, potentially infected with the virus of poliomyelitis, might reach other human beings. Although virus had been demonstrated in the throat, there was no evidence that it appeared in the oral secretions under ordinary circumstances.[3]

Recommendations Regarding Control Measures

During the summer of 1941, the Commission on Neurotropic Virus Diseases of the Board for the Investigation and Control of Influenza and Other Epidemic Diseases in the Army (Army Epidemiological Board) prepared for the Preventive Medicine Service the following statement and recommendations:

A. *General Statements—Virus and Feces in Sewage*

1. It is now abundantly clear that poliomyelitis virus is common in the stools of paralytic and abortive cases of the disease and that during epidemics the virus may be transported a number of miles in sewage.

2. It is of practical importance that during even small outbreaks of paralysis there may be large numbers of abortive cases which furnish an important group of apparently healthy or convalescent intestinal carriers of the virus.

3. Carriers of the virus are more numerous among children than among adolescents or adults. Accordingly, the civilian population is to be considered as a greater potential source of virus than the military.

B. *Recommendations*

1. Keep a graphic record of the occurrence of cases of poliomyelitis in the civilian population, according to counties in the neighborhood of military areas.

2. When poliomyelitis is nearby, prohibit the military personnel from swimming in civilian pools or in any waters contaminated with civilian wastes.

3. Make sanitary inspections of infected civilian areas for unscreened or unsuitable privies or privies built on unsuitable soil, and for unsatisfactory sewage disposal.

Again, in 1943, at the request of the Chief, Preventive Medicine Service, Office of the Surgeon General, the Division of Medical Sciences of the National Research Council sponsored a discussion by outstanding authorities in the field of poliomyelitis which resulted in a number of recommendations including the following:

1. Medical aseptic technique is to be carried out for a minimum of three weeks from the onset of the febrile stage of the disease. Increased attention should be given to the measures prescribed in A.R. 40–210, concerning procedures to be followed in epidemics of

---

[3] Sabin, A. B.: The Epidemiology of Poliomyelitis; Problems at Home and Among the Armed Forces Abroad. J.A.M.A. 134: 749–756, June 1947.

gastrointestinal or respiratory disease including reduction of contact between individuals, hospitalization of suspects and patients, and the application of rigid "typhoid precautions" to hospitalized personnel.

* * * * * * *

3. Tonsillectomies should not be performed during a period of increased prevalence of poliomyelitis.

4. Swimming in water which may be polluted by respiratory or intestinal discharges should be sharply limited when poliomyelitis is prevalent in the area.

It was apparent, however, that a general discussion of preventive measures showed no unanimity of opinion about the likelihood of diminishing the case rate by any practicable measures for isolation of cases or contacts. The opinion was expressed that there is no available way to identify healthy carriers who harbor the virus in the alimentary tract, and without such identification it is impossible to affect the spread of the disease by restrictions on patients and contacts.[4]

Certain important recommendations with regard to the general management of military patients were also made at the conference. Among these recommendations were the following:

1. This conference recommends that in the Armed Forces patients with poliomyelitis should be treated at the nearest available hospital during the acute stage of the disease. It is felt that transportation of the patient during this phase of the illness is hazardous. If special equipment such as a respirator is needed, the equipment should be carried to the patient rather than moving the patient to the equipment.

2. In the opinion of this Conference there is no well established evidence that any special form of local treatment is specifically curative or affects the ultimate outcome or extent of the paralysis.

3. The preponderance of available evidence does not indicate that the use of convalescent serum in treatment of poliomyelitis is efficacious.

Circular Letter No. 175, Office of the Surgeon General, U.S. Army, dealing with the management of poliomyelitis was issued on 20 October 1943 and embodied the basic principles which appeared most reasonable at that time.

EXPERIENCE DURING WORLD WAR II

Incidence Statistics

There are two sources of data from which statistics on the incidence of poliomyelitis in the Army have been derived: (1) The periodic statistical health reports which contain predominantly preliminary or tentative diagnoses and (2) the individual medical records which contain the final diagnosis. The periodic statistical health reports suffer from the fact that the tentative diagnosis is not infrequently different from the final diagnosis, while the individual medical record data are derived from sample tabulations

[4] It has been pointed out more recently, however, that, while isolation of cases and contacts may not significantly affect the ultimate extent of an epidemic, it is, nevertheless, reasonable to regard poliomyelitis patients and contacts as carriers of the virus who present a known risk to others.

and are subject to a certain degree of sampling error. The differences in the statistics for poliomyelitis derived from the two sources for the years 1942–45 are shown in table 39. It may be seen that in 1942 and 1943 the analysis of individual medical records for the total Army as well as for the Army in the United States produced more cases of poliomyelitis than the periodic statistical health reports, while in 1944 and 1945 the reverse was true. Since there is no satisfactory explanation for this discrepancy, it may be well to allow a very large margin of error in utilizing these statistics. Incidence data based on preliminary sample tabulations of the individual medical records for 1940–41 are shown in table 38, and data for 1942–45 in table 40.

TABLE 39.—*Number of cases of poliomyelitis in the U.S. Army by tentative diagnosis, final diagnosis, and year, 1942–45*

Component and year	Tentative diagnosis	Final diagnosis	Difference
Total Army:			
1942	48	62	−14
1943	248	281	−33
1944	350	258	+92
1945	680	405	+275
Total	1, 326	1, 006	+320
Army in the United States:			
1942	36	51	−15
1943	176	200	−24
1944	162	127	+35
1945	212	75	+137
Total	586	453	+133

Data contained in individual medical records and statistical health reports corroborate the impressions of individual observers to the following extent:

1. Poliomyelitis was more frequent in the U.S. Army in the continental United States than in Europe. Only in 1942 was the rate higher in Europe, but the difference was not statistically significant.

2. Poliomyelitis was more frequent in U.S. Army Forces in the Middle East (and Near East), China-Burma-India, and Philippine areas than in other oversea areas and continental United States.

3. Poliomyelitis was rare, or did not occur, in U.S. Army Forces in the Southwest Pacific except in the Philippines, where a surprisingly large number of cases occurred.

TABLE 40.—*Incidence (total cases) of poliomyelitis in the U.S. Army, by theater or area and year, 1942–45*

[Preliminary data based on sample tabulations of individual medical records]

[Rate expressed as number of cases per annum per 1,000 average strength]

Theater or area	1942–45		1942		1943		1944		1945	
	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate
Continental United States	453	0.03	51	0.02	200	0.04	127	0.03	75	0.03
Overseas:										
Europe	59	.01	3	.04	6	.02	25	.01	25	.01
Mediterranean [1]	127	.09			42	.09	40	.06	45	.13
Middle East	21	.14			15	.28	1	.02	5	.12
China-Burma India	77	.18	3	.34	9	.23	25	.15	40	.18
Southwest Pacific	224	.12					34	.06	190	.18
Central & South Pacific	18	.01			6	.02	2	.00	10	.03
North America [2]	4	.01	3	.03	1	.01				
Latin America	13	.03	2	.02	2	.02	4	.05	5	.07
Total overseas [3]	553	.05	11	.02	81	.05	131	.03	330	.07
Total Army	1,006	.04	62	.02	281	.04	258	.03	405	.05

[1] Includes North Africa.
[2] Includes Alaska and Iceland.
[3] Includes admissions on transports.

The mean annual incidence rate (0.034 per 1,000) for the Army forces in the continental United States during the 6-year period 1940–45 was approximately 2 or 3 times higher than that which obtained during the 5-year period 1935–39, and about one-third higher than the rate which prevailed during World War I. While this may represent, in part, the somewhat greater morbidity in higher age groups in recent years, it is also possible that the greater frequency with which cases of aseptic meningitis were diagnosed as poliomyelitis (nonparalytic) during World War II might also have contributed to this difference. Another possibility is that, while the data for World War I cover a period of only 2 years, those for World War II cover a period of 6 years, and it is well known that the incidence of poliomyelitis can vary not only from year to year but also from decade to decade.[5]

It seems highly desirable to know to what extent, if any, the conditions of military life in the continental United States may affect the incidence of poliomyelitis in individuals of Army age. Since the usual statistics on the morbidity rates of poliomyelitis among civilians do not contain data for the age groups which make up the bulk of the Armed Forces, data were obtained for civilian residents of the cities of Cincinnati and Cleveland, Ohio, for

[5] Sabin, A. B.: Epidemiologic Patterns of Poliomyelitis in Different Parts of the World. *In* Poliomyelitis, Papers and Discussions Presented at the First International Poliomyelitis Conference. Philadelphia: J. B. Lippincott Co., pp. 3–33, 1949.

certain years of the 1940 decade (tables 41 and 42). Although these data on the morbidity rates of poliomyelitis among civilians of Army age are obviously not representative of the entire United States, it is, nevertheless, interesting that these rates are of the same order of magnitude as those encountered in the Army in the United States and Europe. This would suggest, as did the experience of World War I, that the conditions of Army life in the United States and Europe do not lead to an increase in the incidence of poliomyelitis.

TABLE 41.—*Incidence of poliomyelitis (paralytic and nonparalytic) among civilian residents of Cincinnati, Ohio, by age group and year, 1945–49* [1]

Age group [2]	1945	1946	1947	1948	1949	1945–49 [3] mean annual
20 to 24	1	1	6	1	5	2. 8
25 to 29	1	1	1	4	4	2. 2
30 to 34	0	1	0	3	3	1. 4
35 to 39	0	1	0	0	1	0. 4
20 to 39	2	4	7	8	13	6. 8

[1] Statistics furnished by Dr. Eugene Wehr and Mr. I. G. Schneider, Bureau of Vital Statistics, Cincinnati Health Department, and Mr. Floyd Allen, Public Health Federation of Cincinnati.

[2] Total population in 20- to 39-year age group was 151,954 in 1940 and 154,353 in 1949.

[3] The average annual attack rate per 1,000 in the 20- to 39-year age group for the period 1945–49 was 0.045. The attack rates in this age group for individual years 1945–49 were 0.013, 0.026, 0.047, 0.052, and 0.087, respectively.

TABLE 42.—*Attack rate for poliomyelitis among civilians of all ages and among those in the 20- to 44-year age group during 4 epidemic years in Cleveland, Ohio* [1]

[Rate expressed as number per annum per 1,000]

Year	All ages		20- to 44-year age group	
	Paralytic only	Total	Paralytic only	Total
1930	0. 159	0. 174	0. 012	0. 012
1941	. 131	. 153	. 042	. 045
1944	. 115	. 145	. 038	. 038
1946	. 146	. 175	. 034	. 047

[1] From data reported by Dehn, H. M.: The Age Incidence of Poliomyelitis in Cleveland. Pediatrics 1: 83–89, January 1948.

The poliomyelitis morbidity rates shown in table 40 for U.S. Army Forces in the Middle East and the China-Burma-India theaters are greatly diluted by calculations based on average strengths per annum and do not properly portray the problems which were encountered by specific units living under certain conditions at certain times. Accordingly, it appears desirable to analyze particular poliomyelitis experiences both in the United

States and abroad in order to obtain some idea of the conditions which predisposed to increases in the incidence of this disease.

Outbreaks in the Continental United States

Perhaps the most important fact about the vast majority of the cases of poliomyelitis in the Army in the United States and Europe is that they were isolated and sporadic and, with the few exceptions to be described, did not result in outbreaks among the units in which they occurred. It may be of interest, from the point of view of military preventive medicine, to examine the few outbreaks of poliomyelitis which did occur in military installations in the United States during World War II, to determine whether or not any lesson may be learned regarding the natural history of such outbreaks and their management.

San Antonio, Tex., 1942

Late in December 1942, the Commission on Neurotropic Virus Diseases was called upon to investigate a poliomyelitis epidemic which occurred in the civilian population of San Antonio, Tex., the location of Fort Sam Houston. It was a late epidemic, by northern standards, since it started in September and reached its peak in November, with cases continuing to occur in December and January of 1943. By the end of December, about 75 cases, including 5 deaths, had been listed in the city and its immediately surrounding territory. Although only 3 cases, one of them fatal, occurred in soldiers, there were a number of cases among the families of officers and men posted in that area. Eleven patients, mostly juvenile members of the families of officers and men living on the post area or its general vicinity, were admitted to the Brooke General Hospital at Fort Sam Houston. Dr. John R. Paul, who investigated this epidemic, was impressed by the manner in which poliomyelitis indirectly becomes a military problem when it appears in the families of military personnel living on a military post. No data are available to indicate whether or not the incidence of the disease was higher among military families than among comparable groups in the population at large. Dr. Paul remarked:

> The opportunity of measuring the incubation period was present in several instances in which children contracted poliomyelitis shortly after their arrival in San Antonio. In most instances this occurred in the families of soldiers recently transferred from areas in which there was no reason to suspect that poliomyelitis had been epidemic. In one child, the onset of the disease began five days after her arrival in the city.

The lesson that one might learn from this experience is that it would appear to be advisable to postpone the movement of children of military personnel into military installations situated in areas in which an epidemic of poliomyelitis is in progress. Although this outbreak might fall into the category of a "winter epidemic" by northern standards, it cannot be so regarded for a southern city such as San Antonio, where the temperature was 60° F. or

higher during most of the period of the outbreak. Poliomyelitis virus was recovered from flies which were collected on 29 and 30 December from one home where two cases of poliomyelitis had developed in mid-November.

Pasadena STAR Unit, 1943

The outbreak of poliomyelitis which occurred in the Pasadena STAR (Special Training and Reassignment) unit in August 1943 is of some interest as an example of the occasional high attack rate in a relatively small group of men under circumstances suggesting not only a common source of infection but also acquisition of the infection during a limited period of time. The STAR unit at Pasadena College, Pasadena, Calif., consisted of approximately 800 men. On 14 August 1943, at a time when no clinical poliomyelitis was recognized in the group, 310 men left for duty at Indiana University, Bloomington, Ind. One of these men, who was slightly ill at the time of departure, developed signs of bulbar poliomyelitis en route and was removed from the train in Colorado, where he died on 18 August.[6] When the group arrived in Indiana, one additional man had paralytic poliomyelitis, although he too had signs of illness on 14 August. Of the 309 men who got to Bloomington, 16 developed signs and symptoms compatible with the diagnosis of paralytic or nonparalytic poliomyelitis during the few days immediately following their arrival. No paralytic cases occurred with onset after 19 August, and in 5 of the 8 men who were reported to have nonparalytic poliomyelitis with onset between 22 and 25 August the diagnosis may be in doubt because the clinical manifestations in these individuals were not associated with any abnormal changes in the cerebrospinal fluid.[7] It is not improbable, however, that even these doubtful cases may represent instances of infection with the poliomyelitis virus, although there is no way of being certain. Shortly after arrival, these men and their contacts were quarantined in separate quarters and were kept in complete isolation for a period not stated in the records. No further cases occurred in this quarantined group or their contacts after the first few days following their arrival, and no cases occurred among the other units on the campus of Indiana University.

Among the men of this unit remaining in Pasadena College, one developed paralytic poliomyelitis with onset on 15 August and another with onset on 20 August. Although the group in Pasadena was quarantined and observed, there is no record of nonparalytic poliomyelitis or other minor illness among them. Furthermore, another man from this unit who was transferred to Camp Santa Anita, Los Angeles County, Calif., on or about 14 August developed paralytic poliomyelitis with onset on 18 August. (Available rec-

---

6 Letter, Maj. M. C. Schlecte, MC, to Commandant, Special Training and Reassignment Unit 3906, Pasadena, Calif., 19 Oct. 1943, subject: Individual Case History Report of Poliomyelitis.

7 Letter, Lt. Col. G. U. Dorroh, MC, Headquarters, 5th Service Command, to The Surgeon General, U.S. Army, 22 Oct. 1943, subject: Poliomyelitis.

ords do not indicate whether he was the only one transferred to Camp Santa Anita from the Pasadena STAR unit or whether others were also sent there.) Seven cases of paralytic poliomyelitis occurred between 14 and 19 August among this group of between 700 and 800 men, giving a paralytic attack rate of approximately 1 percent. If one also includes the 12 possible nonparalytic cases which occurred among the group entrained for Bloomington, the total attack rate would appear to be 2 percent. The brevity of the period during which the paralytic cases had their onset suggests not only a common source of infection but also that this common source was somewhere and somehow connected with the life of this unit at Pasadena and that the infection was acquired during a relatively short period of time.

In reply to a number of specific questions from Col. (later Brig. Gen.) Stanhope Bayne-Jones, MC, then Assistant Director, Preventive Medicine Division, Office of the Surgeon General, the contract surgeon of the unit, Dr. F. C. Hargrave, supplied information which might be of importance in relation to this outbreak. Some of the interesting points in the history of this unit are as follows:

1. During the 6 weeks before the outbreak of poliomyelitis there were two outbreaks of diarrhea which were unexplained on the basis of food or illness in foodhandlers or other demonstrable factors. The first occurred on 2 July, and at that time 259 of the 838 men were affected. The second episode of diarrhea occurred on 23 July, and 242 of the 782 men were affected.

2. The surgeon reported that there was no increase in flies but that he had battled them all summer.

3. Apparently, the use of the swimming pool was compulsory, and the monthly sanitary report for July 1943 stated: "The incidence of nasopharyngeal infection has remained about the same but quite a few have developed either otitis media or otitis externa as a complication." The monthly sanitary report for August 1943 stated: "The incidence of nasopharyngeal infection has been reduced by almost one third and is accompanied by very few complications." The swimming pool was closed on 16 August when the first clinical diagnosis of poliomyelitis was made.

4. There were no changes in messhall personnel, but one new dishwasher arrived on 8 August 1943.

It is extremely interesting that the first cases of poliomyelitis appeared within 6 days after the new dishwasher was taken on. The distribution of the incubation period suggests that all the patients probably acquired their infection at the same time, and the high attack rate suggests that the virus must have been abundant. In view of episodes which occurred elsewhere and which will be described later, one must consider the possibility that the infection may have been acquired from contaminated food or utensils. One can only speculate whether this contamination occurred by means of a single carrier such as might be represented by the newly employed dishwasher or whether the mechanism which was responsible for the two earlier episodes

of extensive diarrhea within the unit might have on this particular occasion been responsible for the dissemination of the heavy dose of poliomyelitis virus. At any rate, it is noteworthy that no cases of poliomyelitis occurred among those who left this unit at the end of July or early August and that no additional cases of poliomyelitis occurred at Pasadena College during 1943 among those who came after the quarantine was lifted. In addition, the introduction of the 309 men to Bloomington, even though they were quarantined rather soon after their arrival, did not result in the appearance of poliomyelitis among the civilian and military personnel associated with this group. Of course it is not possible to predict what might have happened if these men had not been quarantined as efficiently as they were within a short time after arrival in Indiana.

For comparison with the events in the STAR unit in Pasadena, it is of interest to observe happenings among similar units in other schools in the Ninth Service Command, as well as in certain other service commands. The ASTP (Army Specialized Training Program) unit of the University of California at Los Angeles reported two cases of poliomyelitis, one with onset on 27 May 1943 and the other with onset on 18 August 1943. The ASTP unit of the University of Oregon, Eugene, Oreg., also reported two cases, one with onset on 10 September 1943 and the other with onset on 26 September 1943. The Sixth Service Command reported that as of 24 September 1943 there had been no cases of poliomyelitis reported from any ASTP or STAR unit within that service command since 1 January 1943. The Fifth Service Command, in which Indiana University is located, reported on 22 October 1943 that, aside from the cases which occurred in the group transferred from Pasadena College, there had been none reported since 1 January 1943. All of this merely testified to the uniqueness of the outbreak which occurred at the Pasadena College.

Fort McClellan, Ala., 1945

The epidemic which occurred at Fort McClellan in March and April 1945 is the only example of an outbreak of poliomyelitis in an isolated Army camp in continental United States. This epidemic which presented many interesting and unique features was studied by Dr. Robert Ward and Dr. John R. Paul of the Commission on Neurotropic Virus Diseases, and the laboratory work connected with this investigation was carried out with the assistance of Dr. J. L. Melnick at the Yale University School of Medicine, New Haven, Conn. The description which follows is based upon the data presented in the report of these investigators.

Fort McClellan was a large camp situated in northeastern Alabama 6 miles north of Anniston in hilly, forested country. It was predominantly an infantry replacement training center and in March 1945 had a complement of about 30,000 men, most of whom were recent recruits. Seventeen cases of

poliomyelitis, all of them paralytic, occurred within a very brief period of time (February 25 to April 15) yielding a paralytic attack rate of approximately 0.57 per 1,000 men. All the cases were in soldiers. No families or children were involved. The available data on the ages of 16 of the patients indicate that all but 4 were 18 or 19 years of age; 2 were 21; 1 was 25; and 1 was 33 years of age. Ten of the seventeen patients presented bulbar symptoms and three of these patients died yielding a total case fatality of 18 percent. It is striking that, although a thorough search was made, the diagnosis of nonparalytic poliomyelitis was not established in a single case. The first case was recognized only in retrospect. The patient presented himself with weakness of the arms on 1 March 1945, and because his weakness was not at the time associated with fever his illness was not regarded as poliomyelitis, although it was subsequently discovered that he had suffered from a minor illness diagnosed as "nasopharyngitis" on 25 February 1945. The evidence, of course, is not incontrovertible that the diagnosis in this patient was poliomyelitis.

During the period between 25 February 1945, when the onset of the first potential case occurred, and 21 March, when the definite cases began, there were no other cases of the disease. However, between 21 and 28 March, 10 of the subsequent 16 cases occurred. The explosive character of this outbreak strongly suggests again, as in the case of the Pasadena STAR unit, that these infections were acquired almost simultaneously from some common source that happened to be rich in virus, to which a large number of this relatively resistant population of older age group individuals must have been exposed at one time. While the subsequent cases may represent instances of longer incubation periods, it is also possible that at least some of them may represent instances of secondary infection. It is of especial interest, therefore, that an investigation revealed no possible contacts among the cases. Not one patient knew another patient. Of the 17 patients, 2 were in one company and 2 in another company. The remainder of the 17 were scattered throughout the camp. There was no common eating place for all. The interval of approximately 4 weeks between the onset of the first case (assuming that the patient who became ill on 25 February was indeed a case of poliomyelitis) and the subsequent sharp outbreak makes it rather unlikely that he and other undiagnosed cases or carriers were responsible for the "silent" spread of virus throughout the camp which finally resulted in an explosive outbreak consisting entirely of paralytic cases.

The precise determination of which of the various possible modes of spread of the poliomyelitis virus might have been responsible for this unusual outbreak presents almost insurmountable difficulties owing to the inadequacy of the methods available for the detection of virus in various materials and carriers. Poliomyelitis virus was recovered from only one of the three patients with fatal cases, whose central nervous system tissue was tested in

monkeys. Similar tests in monkeys on water, milk, ice cream, flies, and sludge yielded negative results.

In reviewing the data on this outbreak, one is strongly impressed with the possibility that some temporary factor peculiar to this camp might have been responsible for this unusual epidemic. During the month of March when the majority of the cases occurred in the camp, only one other case of poliomyelitis was reported for the entire State of Alabama. Although another case of "poliomyelitis," reported from Camp Sibert, Ala., about 40 miles distant, with a complement of 3,500 men, suggested the possibility that something distributed in common to both camps might have carried a great deal of virus, one cannot be certain of the diagnosis in the patient at Camp Sibert because he presented only the aseptic meningitis syndrome which may or may not have been due to infection with the virus of poliomyelitis. The temperature during March when the epidemic occurred was said to have been unusually warm, almost approaching that of summer weather. Although flies were not yet abundant, the investigators had no difficulty in securing specimens outside five company messes where patients had taken their meals a week or 10 days before. Other observations of interest include the fact that the camp had its own sewage disposal plant located about half a mile from the nearest barracks. The sludge from this plant was dried in beds and then used as fertilizer for the flower gardens on the post. This practice was stopped at the beginning of the epidemic. Although the milk was pasteurized, the investigators found that the sanitary conditions under which the milk was produced were not of the best, and that one of the subproducers had recently been cut off because the prepasteurization bacterial count was very high. Some of the subproducers sent their entire milk supply to the Army camp. Other subproducers divided their milk between the Army camp and the adjacent town of Anniston, in which no cases of poliomyelitis had been detected. The food was procured almost entirely through Army depots which supplied many other Army camps in which no cases of poliomyelitis had occurred. When the investigators inspected the handling of the butter from the quartermaster depot, they were impressed by the number of persons who made contact with this butter which had been manufactured elsewhere. It is, of course, not inconceivable that a healthy carrier working at the quartermaster depot could have contaminated large amounts of butter which was then distributed simultaneously throughout the camp. It is, furthermore, of interest that during March 1945 (the month of highest incidence of poliomyelitis) over 5,000 teeth were extracted at the post, but none from the individuals who developed poliomyelitis. One of the persons with a fatal case of bulbar poliomyelitis had had two impacted teeth removed in December 1944—3 months before the onset of his illness. In view of the long interval, any causal relationship would seem remote.

If the appearance of occasional carriers in Army camps could set off epidemics of poliomyelitis by the many types of intimate contact which occur in such installations, it is odd that so many of the camps in which sporadic cases of poliomyelitis occurred did not have subsequent outbreaks of the disease. For this reason, the observations on the outbreak at Fort McClellan suggest that certain other factors, which have not as yet been identified, are capable of giving rise to a situation in which large numbers of men are infected within a very short period of time with poliomyelitis virus of perhaps unusual antigenic composition and virulence.

Navy installations

Since only two small outbreaks of poliomyelitis occurred among the millions of men in Army installations in the United States during 1940–45, it seems desirable also to analyze several outbreaks which occurred in Navy installations in the United States to supply a greater spectrum for comparison with the events which transpired in certain areas outside the continental United States. Several outbreaks of poliomyelitis which occurred at Navy installations on the West Coast were investigated by Dr. William McD. Hammon, a member of the Commission on Neurotropic Virus Diseases, Board for the Investigation and Control of Influenza and Other Epidemic Diseases in the Army, Preventive Medicine Service, Office of the Surgeon General. Two of these outbreaks were explosive and limited in time, and the epidemiological investigations indicated that the infection had occurred probably as a result of viral contamination of a widely distributed article of food.

The first of these occurred at a U.S. Naval Flight Preparatory School which was located on the campus of the California State Polytechnic College at San Luis Obispo, Calif.[8] In a group of 730 officers and men, 17 cases of poliomyelitis, 9 of them paralytic, occurred, giving an attack rate of 2.3 percent. The dates of onset in 16 of these cases were all between 1 and 8 September. In view of the explosiveness of this outbreak, suggesting a common source of infection during a limited period of time, the following epidemiological observations are of special interest:

1. The cases were rather evenly distributed among the barracks.

2. Several patients had not left the campus at any time during the 3 weeks preceding the onset of their illness.

3. Case rates of each of the four classes present during the month of August were approximately equal; a new class arriving on 2 September was not involved, although this class was present at the time of the onset of illness among the three remaining classes. The swimming pool was used almost exclusively by one class, and a number of the patients had not used it for a month.

---

[8] Goldstein, D. M., Hammon, W. McD., and Viets, H. R.: An Outbreak of Polioencephalitis Among Navy Cadets, Possibly Food Borne. J.A.M.A. 131 : 569–573, June 1946.

4. All of the officers and men ate at the same mess which was operated by civilians.

5. There were about 50 civilians on the campus during the day, consisting mainly of special summer students and employees who ate elsewhere, and no recognized cases of poliomyelitis occurred in this group.

For this reason, the epidemiological study was centered on the barracks, the food and milk supply, and the messhall, and the following potentially significant observations were made:

1. Barracks erected near the school buildings were directly adjacent to areas where large numbers of domestic animals were kept. These included several thousand chickens, horses, pigs, and the dairy herd which supplied raw milk to the school mess. Manure had accumulated in very large quantities in the barns; flies were found in large numbers both in and out of buildings. Many were present in the barracks, but the numbers were very great in the messhall and the milk barn. In the toilet bowls in the barracks, flies were seen crawling over residual fecal smears. These toilet rooms all had unscreened ventilators opening outside. One toilet for the female kitchen help in the messhall was also found to have an open, unscreened window to the exterior. Each time the toilet room door was opened, flies had ready access to the kitchen.

2. Investigation of the manner in which the milk was handled suggested that if the flies on this campus were in one way or another contaminated with poliomyelitis virus, ample opportunity presented itself for contamination of the milk. Numerous flies were found on the cloth diaphragms through which the milk from the milking machines was filtered. The milk cans had been sterilized previously, but they were open and contained many live flies at the time the milk was run into them. In the messhall, flies were found crawling about in empty washed pitchers in which the milk was to be served at mealtime. All patients drank milk regularly with their meals. They claimed that dead flies were regularly found in their glasses and in the pitchers. Milk from the same sources were also served at the soda fountain, and all patients had on recent occasions had milk drinks at that fountain. It should be noted here that, following this survey and one made simultaneously by the Navy, these conditions were corrected; remedial measures included pasteurization of all milk and improved fly control.

Other factors of interest in this outbreak were that, of the 17 military cases, 3 occurred among individuals who had left this school for assignment to flying fields in Nevada, approximately 6 days before the onset of first symptoms in the cases remaining at the training school at San Luis Obispo. The exact number of men who were in the class that graduated at the end of August and left this school is not stated, although it is possible that it may represent very roughly one-quarter of the total strength in that school.

One additional case was considered as belonging to this particular outbreak. This was in a girl who was a friend of one of the graduate patients

and had attended the school commencement and who developed paralytic poliomyelitis at the same time as her friend among the graduate patients. Counting the girl's case, the total number of cases in this outbreak was 18; 10 of them were paralytic, but none were fatal. At about the same time, 100 other cadets were ill with symptoms of minor illness which could have been due to infection with poliomyelitis virus. Furthermore, among 30 graduates who went to one training field, 6 men in addition to the 2 who were paralyzed were found to have been sick and off duty at least 2 days in the second week of September with undiagnosed illnesses which, by the reported symptoms, might well have been abortive poliomyelitis. None of the other men at this field belonging to groups who had been graduated from other schools were ill during the same week. Again, it is important that, at another of the flying fields where one case of paralytic poliomyelitis occurred among the graduates who came from San Luis Obispo, there were no other cases of poliomyelitis reported during the following several weeks, either among those who came from San Luis Obispo or among other personnel. This is of particular importance, because it shows that the infection which was apparently so extensive as to cause an attack rate of 2.3 percent (not counting the minor illnesses) among those who were exposed at some particular time at San Luis Obispo failed to spread by the ordinary methods of contact in the other flying fields to which graduates of this school had gone, or as a result of the frequent visits of individuals from this school to the adjacent town.

Because the patients exhibited a rather high proportion of what were termed cerebral manifestations, such as insomnia, confusion, and irritability, encephalitis was frequently the original diagnosis. Furthermore, since the paralysis showed a predilection for the muscles supplied by the cranial nerves and the cervical levels of the spinal cord, frequently giving rise to the shoulder girdle type of paralysis, serologic tests were also carried out for Russian spring-summer encephalitis virus. However, infections with this virus, as well as with the viruses of western equine and St. Louis encephalitis, were ruled out by serologic tests. Poliomyelitis virus was isolated from the feces of three of four patients tested, and prolonged clinical studies left little doubt that the diagnosis of poliomyelitis was justified in all cases. Finally, it is worth mentioning that, approximately 10 days before the onset of the first case of poliomyelitis, there had occurred among the military personnel at the San Luis Obispo school 20 cases of an illness which was diagnosed as epidemic pleurodynia and was characterized by fever and chest pain, and it is particularly interesting that 2 of the 20 individuals with this illness later developed poliomyelitis.

The second outbreak, in which pasteurized milk contaminated during handling at the messhall was suspected as the probable common source of infection, occurred in a U.S. Naval Receiving Station at Portland, Oreg., during October and November 1944. The analysis which follows is based

upon information contained in the report of Dr. Hammon submitted to the Commission on Neurotropic Virus Diseases in 1945 and in a report published 5 years later by Lt. Comdr. Frank P. Mathews of the Naval District Epidemiological Unit.[9] This outbreak occurred among 1,400 men who were billeted at this receiving station awaiting orders to board naval vessels which were under construction in the area. The station consisted of a group of five, two-storied wooden barracks, a messhall, and an office building, and it covered one city block in a partly built-up industrial section of Portland. The onsets of 11 cases of paralytic poliomyelitis occurred in this group of U.S. Navy personnel during the period 29 October–17 November. Four of the cases were in officers, and the disproportionate incidence among officers and enlisted men was a very striking phenomenon. The virus involved in this particular epidemic appears to have been one of great virulence since 4, or 36 percent, of the 11 patients died of the disease. Dr. Hammon, furthermore, pointed out that, despite a careful medical check on all persons in this installation, the diagnosis of abortive or nonparalytic poliomyelitis was considered in only 6 individuals, and most of these were also finally released without a diagnosis. There can be no question of a common source of infection for the first group of 6 cases, which included the 4 fatal cases, with onset between 29 October and 2 November. This group of 6 cases included those in all four of the officers. Since the incubation period of poliomyelitis can be quite variable, it is not improbable that the other five cases of poliomyelitis which occurred between 7 and 16 November might also have acquired their infection at the same time. However, there is a strong possibility that at least one case in this second group of five patients might represent an instance of a secondary case. This occurred in a pharmacist's mate, who, 7 to 10 days before the onset of his symptoms on 12 November, had been caring for one of the first poliomyelitis patients. During the course of his care, he had been obliged to aspirate the patient's pharynx very frequently.

An analysis of the various potential sources of infection finally narrowed itself down to a strong suspicion centering on the milk supply. While the four officer patients all lived in Portland at hotels or at home and all the patients among the enlisted men lived in the barracks, the officers, nevertheless, took their noon meal at the barracks. Since the investigation of various potential sources of infection had narrowed itself down to some article of food that might have been served uncooked or raw during the period 25–26 October (a date selected because one of the patients with onset on 1 November arrived at the station on 25 October), and since the attack rate among the officers was about 10 times higher than that among the enlisted men, the question arose as to what food had been served more generously to the officers than to the enlisted men. Mathews noted:

One outstanding such item was found to have been milk. For several months, an adequate supply of milk had not been available for the whole station. The enlisted

[9] Mathews, F. P.: Poliomyelitis Epidemic, Possibly Milk-Borne, in a Naval Station, Portland, Oreg. Am. J. Hyg. 49:1–7, January 1949.

men had been deprived of it first. During October, the only milk served to the enlisted men had been a ladleful on the breakfast cereal. There had been none to spare for use as a beverage. On the other hand, each officer was provided with a glass of milk at his place for each of the 3 meals, instead of the customary glass of water. Furthermore, waiters refilled these glasses as they were consumed, even without waiting for a request to do so.

Although the milk and cream which were delivered daily in bulk were pasteurized, the manner of handling the milk after delivery would not have prevented its contamination by a poliomyelitis virus carrier. The milk was poured into an open dishpan for the enlisted men's breakfast, and a mess attendant scooped out a ladleful for each man's cereal. The dipper or dishpan, or both, could have been contaminated by the fingers of the dispenser. At the end of the enlisted men's breakfast, it was customary to pour the milk left in the dishpan into pitchers to furnish drinking milk in unlimited quantities to the officers for their breakfast and later meals the same day. The possibility was considered that the very much higher attack rate among officers might have been due to the fact that they had drunk so much more of the milk and, therefore, had consumed larger amounts of virus, or that the infecting event on a particular day had occurred after most of the enlisted men had already been served. It is of interest in this connection that the onset of illness was almost simultaneous in all 4 officers, and that 2 enlisted men whose onset was at the same time as that of the officers developed the disease in the most severe form and died.

A third outbreak of unusual interest occurred in 1944 among Navy V-12 trainees and civilian students at Occidental College, Los Angeles, Calif. The chief points of interest in this outbreak are not only the high attack rate, comparable to that described in previous episodes, but more especially the periodicity and grouping of the cases, as well as the fact that the outbreak remained localized among the student body without any spread to individuals or families outside the college with whom the students had abundant contact. The data reported here are taken in part from the report submitted by Dr. Hammon to the Commission on Neurotropic Virus Diseases as modified by a subsequent, personal communication from Dr. Hammon, which contained additional details.

The school was coeducational, and the student body consisted of about 800, approximately one-half civilians and one-half Navy V-12 trainees. Twenty-three cases of poliomyelitis, sixteen of them paralytic and two of them fatal, occurred in this group during the period from 9 April to 29 July. The attack rate during the semester when most of the cases occurred was 2.8 percent; since a change of term involved graduation of one group and introduction of a new one, the exposed population was somewhat greater, but only one case occurred in the new group after the vacation period which ended on 1 July. The first patient, with onset on 9 April, had an illness which was regarded as nonparalytic poliomyelitis. If the analysis of this outbreak is confined to the paralytic cases, only several distinct waves are

noted which are very closely grouped together. During the first wave, there were five patients with paralytic poliomyelitis who had their onset between 9 and 12 May. In the second wave there were three patients with paralytic poliomyelitis whose onset was between 22 and 26 May. After the vacation period, which lasted from 23 June to 1 July, four additional paralytic cases occurred with onset between 16 and 18 July, and the final group of cases with onset between 23 July and about the last of the month.

Most of the students were in residence on the campus, a few in rooms near the campus, or at home. Infections occurred in all large dormitories, in one private home adjacent to the campus, and in one nearby fraternity house. Male and female civilians and Navy students were involved in proportionate numbers. Nearly all students ate three meals on the campus in the student cafeteria, and all the poliomyelitis patients took practically all their meals there. During the period of the outbreak, there were unusually few cases of poliomyelitis reported from the rest of the city of Los Angeles, and for these no connection with the college could be traced. The activities of the students off the campus were not limited, and yet no secondary cases were traced to their visits even in families where there were children. There were many common factors in the group, which may have concerned their exposure, but all centered in life on the campus. During the various periods of apparent activity of the virus, there were several waves of increased incidence of so-called upper respiratory infection, including many cases febrile in nature, and there was one outbreak of gastrointestinal disorders. Throat cultures made by Dr. John Kessel on about 30 febrile patients during the wave of so-called upper respiratory infection showed that most had beta hemolytic streptococcal infections. Stools from most of these patients were tested either in Dr. Kessel's laboratory or in Dr. Hammon's laboratory, by monkey inoculation, but no poliomyelitis virus was isolated. Dr. Kessel did succeed in recovering one strain of poliomyelitis virus from one of the paralytic patients in whom the onset of disease occurred on 10 May.

An investigation of the possibility that some article of food consumed by the students on the college campus might have been responsible for the periodic outbreaks of the illness revealed that the practices and equipment in the dining room and kitchens were entirely adequate from a sanitary point of view. The possibility that one or more carriers of a particularly virulent strain of virus might, nevertheless, have been acting as disseminators of infection led to the testing of stools from several of the foodhandlers by Dr. Kessel, who obtained negative results. Dr. Hammon finally concluded: "All evidence points to some local factor, as of paramount interest, although a number of individual infections could be satisfactorily explained by intimate contact with a known case 7 to 10 days prior to onset. However, contact off the campus with children and non-college dates did not result in apparent infection." When one considers the limited facilities and

methods that are available for investigating such outbreaks in a search for carriers of poliomyelitis virus, it is not surprising that the local factor, although sought, was not found. The unique periodicity of this outbreak on the campus of Occidental College has a striking counterpart in an epidemic which occurred in New Zealand troops in Egypt during the period November 1940 to July 1941.[10]

Outbreaks in U.S. Forces Overseas

Middle East, 1943

Before the arrival of American troops in the Middle East, the British noted that the incidence of poliomyelitis in their armed forces was unexpectedly high. Van Rooyen and Morgan [11] reported that in 1941 a total of 74 cases were diagnosed as acute poliomyelitis or polioencephalitis and that, of these, 19, or 26 percent, were fatal; in 1942 there were 32 cases, 14, or 44 percent, of them fatal. The attack rates for the British troops were not given. Brigadier McAlpine [12] reported that the incidence per thousand of British troops in the Middle East was 0.31 in 1943 and 0.42 in 1944. This may be compared with attack rates of 0.02 per thousand for British Army forces at home during 1943 and 1944. It should be noted, however, that overall attack rates of this nature in the Middle East are frequently misleading as regards the actual incidence of the disease in a given group or force in a given period of time at a given place. Since poliomyelitis does not occur in similar numbers in different groups under different conditions of life, and since the overall attack rate is calculated on the average strength, which varied in a theater that was as mobile as that of the Middle East, one may be justified in assuming that the actual attack rate in certain forces was considerably higher than 0.3 or 0.4 per 1,000. However, whatever the statistics may be, it is evident that individuals of military age in the British forces in the Middle East had a risk of acquiring paralytic poliomyelitis which was at least 15 to 20 times greater than that of the British forces at home. Furthermore, the disease which they acquired in the Middle East was particularly virulent, and the case fatality rate was high. The work of Van Rooyen and Morgan on the recovery of many strains of poliomyelitis virus from these patients left little doubt of the diagnosis.

According to preliminary sample tabulations of individual medical records, 21 cases of poliomyelitis occurred among Americans in the Middle East theater. It was clear to the observers on the scene that the incidence of poliomyelitis among U.S. troops was proportionately about the same as

---

[10] Caughey, J. E., and Porteous, W. M.: An Epidemic of Poliomyelitis Occurring Among Troops in the Middle East. M.J. Australia 1: 5–10, January 1946.

[11] Van Rooyen, C. E., and Morgan, A. D.: Poliomyelitis: Experimental Work in Egypt. Edinburgh M.J. 50: 705–720, December 1943.

[12] McAlpine, D.: Epidemiology of Acute Poliomyelitis in India Command. Lancet 2: 130–133, August 1945.

that among the British troops. The first interim report of the Commission on Neurotropic Virus Diseases in 1943 remarked on the occurrence of poliomyelitis in U.S. troops, particularly among those stationed in Libya (in the vicinity of Bengasi), in Egypt (in the neighborhood of Cairo and Alexandria), as well as in Palestine. Although many of the cases were sporadic, it was noted that two outbreaks which might be termed epidemics had been recorded with rates of between 0.5 and 1.3 per 1,000 among groups of 25,000 men. It is interesting to note in this connection that several different attack rates have now been published on the incidence of poliomyelitis in American forces in the Middle East. Paul, Havens, and Van Rooyen [13] in 1944 gave the rate of 0.425 per 1,000 for the cases up to 1 October 1943. Brigadier McAlpine, writing in 1945, gave the rate of 1.4 per 1,000 for American forces in the Middle East in 1943. In a 1949 publication, Paul [14] gave the rate of 0.26 per 1,000 for American troops in the Middle East in 1943. It appears that all of these rates are probably correct for certain groups, and that the lower rates represent a dilution resulting from inclusion of larger areas and forces not necessarily living under similar conditions.

Dr. Paul, who had an opportunity to observe poliomyelitis in military personnel in Egypt at first hand, made the following observation on clinical epidemiology:

> Contacts and living quarters were investigated in 10 military cases of poliomyelitis or polio-encephalitis which were probably acquired in Cairo between May 1 and October 15, 1943. The cases were ubiquitous as to their place of origin. No two patients seem to have been in contact. No civilian cases were discovered among adults or children living in close proximity to the patients' living quarters. This does not mean that epidemics of poliomyelitis do not occur in the Middle East. Caughey has described an epidemic of poliomyelitis which occurred in 1941 among New Zealand troops stationed in Egypt. Subsequently, there have been other small localized outbreaks. During the summer of 1943 there were two of these—in Libya and in Tripoli. We did not have the opportunity of examining these situations at first hand.

In an attempt to correlate these observations on the unexpected higher incidence of poliomyelitis in the British and U.S. troops in the Middle East with the occurrence of poliomyelitis in the native population, Dr. Paul made inquiries regarding the incidence of poliomyelitis in Egypt and in Palestine. Since the official statistics on the occurrence of poliomyelitis in Egypt were obviously unreliable, he inquired into the number of admissions for poliomyelitis in two children's hospitals in Cairo over a period of years from 1933 to 1942. It appeared that during that period the total number of new cases of poliomyelitis admitted each year varied from 22 to 96 during the years 1933–39 and from 110 to 201 during the years 1940–42. This constituted approximately from 2 to 12 cases of poliomyelitis for every

[13] Paul, J. R., Havens, W. P., Jr., and Van Rooyen, C. E.: Poliomyelitis in British and American Troops in the Middle East: The Isolation of Virus from Human Faeces. Brit. M.J. 1: 841–843, June 1944.

[14] Paul, J. R.: Poliomyelitis Attack Rates in American Troops, 1940–1948. Am. J. Hyg. 50: 57–62, July 1949.

10,000 patients admitted to those hospitals and dispensaries per year. Furthermore, it was of interest that most of the new patients admitted for poliomyelitis were under 5 years of age. The local juvenile cases were said to have been mild usually, and severe bulbar cases were rare. The professor of pediatrics, who helped to supply these data, stated that he had seen only two cases of severe acute ascending paralysis in local children. Poliomyelitis in the native Egyptian adult seems to be rare, according to Dr. Paul, and, from verbal accounts, there were no cases observed at the military general hospital during the period of inquiry in 1943. It is, of course, obvious from this that clinical poliomyelitis is observed and does occur in native Egyptians. However, the expressions "common" or "uncommon" can hardly convey the actual attack rate and incidence of poliomyelitis in a population of 16 million Egyptians. Considering that the hospitals under investigation receive patients not only from Cairo but probably also from many thousands of people around the great metropolis, the total number of patients in the native population does not appear to the author to be large by American standards. Furthermore, it is important to remember that a city like Cairo provides a striking variety and contrast in living standards—that it represents a population of mixed racial, social, and economic groups, and may not actually reflect the incidence of the clinically apparent paralytic disease in the very poor portion, or vast majority, of the Egyptian population.

As regards Palestine, Dr. Paul quotes a study by Levy published in 1937 which again was said to indicate that poliomyelitis was not uncommon in Palestine. Actually, for the 20-year period from 1915 to 1934, the investigator was able to collect from the records of orthopedic dispensaries and physicians a series of 215 paralytic cases, or an average of 10 cases of paralytic poliomyelitis per year. Once again one must recall, in analyzing the data from Palestine, that the population there represents a very mixed group as regards living habits and standards. The Jews, both native and immigrant, have, on the whole, a living standard that is quite different from that of the majority of Arabs. As regards poliomyelitis, the Jews, in fact, may be compared with the British and American troops coming into these areas. It is, therefore, of particular interest to note in the study quoted by Dr. Paul that poliomyelitis was not common among the large native Arab population and that the highest prevalence was among the Jews. It was stated that the average attack rate was 20 times higher among the Jews than among the Moslems. The point of this discussion is that, while cases of poliomyelitis may be relatively rare or uncommon among the poor native populations of the Middle East, the disease does occur in that area and the possibility exists that the infection may actually be very much more widely disseminated in the area than it is in the areas from which the U.S. and British troops came. Thus, the lesson of importance to military preventive medicine regarding poliomyelitis in the Middle East is that the native population, particularly that portion of it with the poorer hygienic living conditions and standards very

likely provided a considerably greater source of poliomyelitis virus than was ordinarily present in the United States or in Britain and that, accordingly, one might expect a higher rate of poliomyelitis among troops living in close proximity to the local population. The possibility that unusual immunologic types of virus may also have been responsible for the increased incidence of poliomyelitis among the British and U.S. Armed Forces must be considered but has not as yet been investigated. In this regard, it is noteworthy that at least two of the strains of poliomyelitis virus (MEF_1 and Phillips) recovered from fatal military cases proved to be of the Lansing type, which is very widely disseminated throughout the world.

Philippine Islands, 1944–45

The first case of poliomyelitis in U.S. forces had its onset 16 days after the beginning of the occupation of Leyte on 20 October 1944. This was followed by a relatively high incidence of the disease which was particularly intriguing because it represented the first appearance of poliomyelitis among U.S. forces in SWPA (Southwest Pacific Area).[15] According to the statistical health reports, 39 cases of poliomyelitis occurred during the months of November and December 1944 in a force which varied from an initial strength of about 200,000 to a little over 300,000 at the end of the year, and 246 cases for all of 1945 for a force which varied from 300,000 to 600,000. There is reason to believe, however, that this does not include all the cases. For example, the report of the virus team of the 19th Medical General Laboratory [16] lists 37 paralytic cases with 12 fatalities and 10 nonparalytic cases among Army, Navy, and Marine Corps personnel, with onset in November and December 1944, which they studied at only two hospitals on Leyte, while the statistical reports at the Office of the Surgeon General list only 39 cases with 14 fatalities. Furthermore, in 1945, the illness of patients with paralysis reaching the larger hospitals after some delay was frequently diagnosed as Guillain-Barré syndrome (infectious polyneuritis), because the cerebrospinal fluid at the time of examination exhibited an increased protein content without pleocytosis.[17] Since this "albuminocytologic" dissociation is very common in poliomyelitis after the acute stage, it is not improbable that many of the Guillain-Barré cases were convalescent poliomyelitis.

With few exceptions, the data presented reflect almost entirely the incidence of paralytic poliomyelitis. Thousands of cases of fever of unknown origin which were generally regarded as atypical dengue occurred on Leyte [18] and

[15] Letter, Col. Henry M. Thomas, MC, to Chief Surgeon, U.S. Army, Services of Supply, SWPA, 29 Dec. 1944, subject: Acute Anterior Poliomyelitis at Leyte Island.

[16] Report, Virus Team, to Chief Surgeon, U.S. Army, Services of Supply, SWPA, 28 Dec. 1944, subject: Poliomyelitis and Other Virus Diseases in Tacloban-Palo-Dulag Area of Leyte.

[17] Essential Technical Medical Data, U.S. Army Forces, Pacific, for June 1945.

[18] Letter, Maj. F. T. Billings, MC, to Brig. Gen. S. Bayne-Jones, Preventive Medicine Division, Office of the Surgeon General, 23 Mar. 1945, subject: Serum From Patients With Fever of Unknown Origin in the Philippines.

elsewhere in the Philippine Islands, frequently in close association with cases of paralytic poliomyelitis. Large numbers of iced serums collected by Maj. (later Lt. Col.) Frederick T. Billings, Jr., MC, from such cases of "atypical dengue" in Leyte and others collected subsequently by Lt. Col. (later Col.) Cornelius B. Philip, SnC, were tested by the author in many human volunteers in the United States without the recovery of dengue virus, although a similar procedure resulted in the recovery of many strains of dengue virus from atypical cases in New Guinea. It is not improbable that many of these cases of so-called atypical dengue were actually abortive poliomyelitis, although actual proof is lacking.

An incidence of 246 predominantly paralytic cases of poliomyelitis with 52 deaths for a population of 300,000 to 600,000 (the data for U.S. forces in the Philippines in 1945) would constitute a sizable epidemic in any American city, except that in an American city approximately 85 percent of those cases would have occurred in children 15 years of age or younger. To account for this relatively high attack rate in individuals of Army age, one is forced to assume that the dose of virus to which these men in the Philippines were exposed was exceptionally great, that the immunologic types of virus were unusual for them, or that both of these conditions existed. While the total number of men affected is still very small to be significant from the point of view of military operations, serious problems were, nevertheless, raised for the medical installations, particularly since cases of ascending paralysis with involvement of the respiratory muscles were very numerous.

The distribution of cases during different months of the year (table 43) indicates that the virus was available the year round, although the attack rates frequently varied during different months. A good deal of light was thrown on the epidemiological pattern by two studies carried out by officers of the 19th Medical General Laboratory on the first group of cases which occurred in Leyte in 1944 and on an outbreak at the Laoag Army Air Base in 1945.

Outbreak on Leyte, 1944.—The first case of poliomyelitis had its onset on 5 November 1944, 16 days after landing, in the first group of troops to reach the island. Thirty-seven paralytic cases and ten nonparalytic cases were then seen at one evacuation hospital and one station hospital. The following observations from the epidemiological notes of the virus team are of special interest:

> The cases of clinically evident anterior poliomyelitis have occurred in widely scattered areas at a distance from fifty yards to thirty-five miles from the point of hospitalization. In one instance three cases occurred in the same U.S.M.C. organization but in different units. *With rare exceptions there is no history of contact between the units involved.* With one exception, no two men came to Leyte on the same ship. The men have come from the United States, the Hawaiian Islands, Australia and many points in and around New Guinea.
>
> In only one instance [a medical corps soldier] has clinically evident paralysis occurred in a man who was in known contact with poliomyelitis patients. This man took care of respiratory cases the first week in December and developed his illness

within 14 days. He was also a member of the 124th Station Hospital detachment in which several possible abortive or preparalytic cases have occurred.

There was no uniform history of an increase in upper respiratory infections in the units involved. Seven among 23 of the patients report having had diarrhea or dysentery since arriving on Leyte and some of these episodes occurred within the possible incubation period of the poliomyelitis. This has no statistical significance in view of the prevalence of diarrhea and dysentery occurring under combat conditions. It does indicate, however, that many of the patients had ingested human feces since arriving on the island, some of which possibly could have contained poliomyelitis virus.

TABLE 43.—*Incidence of poliomyelitis in the U.S. Army in the Philippines, by month, 1944–46*

[Data based on statistical health reports]

[Rate expressed as number of cases per annum per 1,000 average strength]

Month	1944		1945		1946	
	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate
January			23	0.7	15	1.0
February			13	.4	5	.5
March			18	.4	3	.3
April			36	.8	7	.9
May			33	.7	3	.4
June			37	.6		
July			11	.2	19	2.6
August			19	.3	18	2.0
September			20	.4	11	1.6
October			9	.2	6	.9
November	7	0.4	13	.3		
December	32	1.2	14	.6	1	.2
Total	39	.9	246	.4	88	.8

In the presence of frank paralytic poliomyelitis, increased interest has been attached to men with headache, fever, stiff neck and orbital pain. * * * Several of these men [observed in the two hospitals where the virus team worked] have had an increased spinal fluid cell count, predominantly lymphocytic in character, but have made a rapid and uneventful clinical recovery with no evidence of paresis or paralysis. Such men may constitute the abortive and preparalytic cases which are to be expected in the usual outbreak of poliomyelitis. Early in November 1944, four men with similar findings were diagnosed as benign lymphocytic choriomeningitis in the 165th Station Hospital. * * * Several such questionable cases were definite contacts of known poliomyelitis patients or occurred simultaneously within a group. Six men in the 893d Clearing Company operating the civilian hospital at Palo simultaneously developed fever and severe headaches. Only one developed paralysis. During this time the personnel of the 91st Station Hospital were working with the 893d Clearing Company prior to assuming complete charge of the civilian hospital and at least three of their men developed similar symptoms within 2 weeks. The entire picture is complicated by the fact that dengue fever is apparently occurring here and presents prodromal symptoms initially comparable. [The "dengue" observed in "thousands" of soldiers in Leyte was atypical without rash.

559625v 61— 27

and tests in many human volunteers in the United States of serum specimens, which had been obtained in Leyte within 24 hours after onset, yielded no virus.[19]]

No evidence of poliomyelitis has appeared among the Filipinos although several hundred passed through the civilian hospital during the time the men mentioned above were ill; in addition many civilians are employed in the hospitals. *In the Philippine Islands poliomyelitis is considered to be a disease of white people.* The last definite case of poliomyelitis reported from Leyte occurred in 1938. Civilian health records in the area where many of the soldier cases of poliomyelitis have occurred are remarkably complete because the Japanese authorities required a daily health report on infectious diseases occurring among the civilians. Local Filipinos have now been exposed to poliomyelitis for more than six weeks. To date no cases of paralysis have been reported to this investigator. The estimated population of Tacloban in December 1943 was 33,795 and of Palo, for the same period, 27,335.

The characteristic clinical manifestations in the paralytic cases and the histological findings in the brain and spinal cord of a number of the fatal cases left little doubt regarding the diagnosis. However, there was considerable speculation as to whether the virus was brought in by the troops who came from the United States or whether it was of local origin. Col. Henry M. Thomas, Jr., MC, the medical consultant who studied these patients on Leyte, stated: "* * * certain facts seem fairly sure, however, and these point to the introduction of the reservoir into Leyte with the troops." [20] The facts responsible for this impression were, first, that no recent cases of poliomyelitis had been uncovered among Filipinos and, second, that in one area a case had developed 5 days after the soldier had arrived in Leyte. The fact that no recent cases of poliomyelitis had been uncovered among the Filipinos cannot be taken to indicate that poliomyelitis virus was not in fact being disseminated rather abundantly by the native population. Antibody studies in various parts of the world among populations with a negligible incidence of paralytic poliomyelitis living under primitive or poor sanitary conditions have suggested that poliomyelitis virus is widely disseminated among them. The second fact regarding the development of a case of poliomyelitis within 5 days after arrival in Leyte has no bearing on the reservoir of the virus since the onset was well within the incubation period of the disease. Furthermore, this particular patient had arrived in Leyte on 13 November at a time when the first cases of poliomeylitis had already made their appearance in other units which had arrived earlier. The following observations strongly favor Leyte as the reservoir of the virus:

1. The invasion force spent, on the average, more than a month on board ship without the appearance of any cases of poliomyelitis.

2. The first case did not appear until 16 days after the invasion began.

---

[19] (1) Report, Lt. Col. Albert B. Sabin, MC, to Preventive Medicine Division, Office of the Surgeon General (Attn: Brig. Gen. S. Bayne-Jones), 24 July 1945, subject: Human Transmission Tests With Sera From F.U.O. Cases on Leyte (P.I.) During Feb. and Mar. 45. (2) Report, Lt. Col. Albert B. Sabin, MC, to Preventive Medicine Division, Office of the Surgeon General (Attn: Brig. Gen. S. Bayne-Jones), 28 Dec. 1945, subject: Human Transmission Tests With Sera From "F.U.O." Cases on Mindoro, P.I. During Mar. and Apr. 45.

[20] Letter, Col. Henry M. Thomas, Jr., MC, to Chief Surgeon, U.S. Army, Services of Supply, SWPA, 29 Dec. 1944, subject: Acute Anterior Poliomyelitis at Leyte Island.

3. The cases were scattered widely as regards time and space among many different units which had no contact with one another.

4. No poliomyelitis was observed in these troops while they were in New Guinea and other islands in the Southwest Pacific, where they were stationed beyond the range and influence of native villages.

5. The incidence of poliomyelitis continued to be high among the American forces in the Philippines in 1945 and 1946 with attack rates markedly in excess of those encountered in the Army in the United States.

An examination of the dates of onset of the cases in two different regions of Leyte suggests that the reservoir was continuous rather than temporary and explosive as was the case, with one exception, in the outbreaks in military units in the United States. Furthermore, the strikingly different case fatality rates in the two areas (62.5 percent in the Palo-Tacloban-Carigara area of north Leyte and 5.3 percent in the Dulag areas of central Leyte) strongly suggest that strains of virus of different virulence may have been prevalent in the two areas. Although Colonel Thomas was inclined to correlate this difference in mortality with the fact that one force was staged in New Guinea where mortality from the disease was high, and the other force in Hawaii, an examination of the individual records of the patients from the Dulag area shows that some of the patients came from the New Guinea area and some from Hawaii. Similar differences in mortality rates have also been encountered in different outbreaks in military units in the United States as well as during different epidemics at different times among civilian populations.

If one grants that the reservoir of virus was indeed in Leyte and other parts of the Philippine Islands, it is of interest to note the conditions which could easily have contributed to its dissemination among U.S. military personnel. Since it has been abundantly demonstrated that the feces of patients and of inapparently infected individuals constitute a rich source of virus, and since experimental infection by the oral route has been proved to reproduce the inapparent, nonparalytic and paralytic manifestations of poliomyelitis, one cannot disregard the various routes by which human feces, potentially infected with the virus, may reach susceptible individuals. The following description of the conditions, in the Philippines, in part I of the 1945 Annual Report of the Chief Surgeon, USAF WESPAC (U.S. Army Forces, Western Pacific), clearly indicates the potential source of poliomyelitis virus as well as of other infectious agents predominantly present in human feces:

> With the invasion of the Philippines certain new disease problems were encountered and the question of sanitation assumed new importance because of the civilian population. * * * Sanitary habits of the civilian population * * * menaced the health of the troops. The situation was more acute than it might otherwise have been because no restrictions were placed upon fraternization with the civilian population. Troops ate large quantities of food and delicacies prepared by friendly Filipinos under uncertain sanitary conditions, a fact which goes far to explain the high incidence of diarrhea and dysentery encountered in the Philippine operations. * * * Satisfactory sanitation was at

all times difficult to achieve, not only because of the civilian population and the tendency to station troops in or near barrios and towns, but also because many areas had high water tables which were further heightened by torrential rains.

Due to the lack of latrines, the heavy fly population, and the civilian habits of defecating on the ground, it was not surprising that the troops stationed in the midst of densely populated regions exhibited a high incidence of those bacterial, protozoal, and viral infections which are predominantly found in human feces. Amebic dysentery, seldom seen in New Guinea, was encountered in high rates on Leyte, even though surveys of the civilian population of Leyte disclosed pathogenic amebae in less than 1 percent. The aforementioned annual report for 1945 also contained the following statement: "Combat troops of the Sixth Army suffered much more from infectious hepatitis than did service troops in the first quarter of 1945. The rate for Sixth Army troops on Luzon was 50 per 1,000 per annum in February and reached about 200 per 1,000 per annum in May."

It is of interest, in this respect, that one of the Leyte patients who developed paralytic poliomyelitis on 6 December 1944 also came down with infectious hepatitis 11 days later.

Outbreak at Laoag Army Air Base, 1945.—This outbreak, which was investigated by Lt. Col. A. J. French, MC,[21] of the 19th Medical General Laboratory, is interesting not only because of its explosive character and focal concentration but also because it points to potential sources of virus in a military installation which is located at some distance from an inhabited area. Although the strength is not reported, 22 cases occurred in this outbreak. The majority of the cases occurred during the month of May, and the onset of at least 8 paralytic cases occurred between 19 and 22 May. Because 7 patients had been evacuated by the time Colonel French arrived, his study was limited to 15 patients, among whom only 4 were nonparalytic. Three of the total of twenty-two died, and a complete histologic examination of the nervous system in one case confirmed the diagnosis. The following epidemiological observations were made:

1. The units in the main bivouac area had occupied areas previously utilized by Japanese troops. Open latrines with myriads of fly breeding areas were scattered throughout the troop areas.
2. Screening and DDT were not generally available.
3. While natives were not housed near the troop areas, there must have been some within one-half mile of the reservation, since on 1 June 1945, the military governor issued a directive regarding the construction and fly-proofing of latrines by Filipinos living on the Air Base Reservation or within one-half mile; furthermore, Filipino laborers working at the base had their own latrines there.
4. Twenty of the 22 cases were housed in an area covering approximately 1,000 square yards.
5. Bathing in the Laoag River was not a common occurrence due to the fact that it was some distance from the main troop area. Five of the cases had bathed in the river.

21 Letter, Lt. Col. A. J. French, MC, to Chief Surgeon, USAF WESPAC, 25 June 1945, subject: Investigation of Poliomyelitis Outbreak at Laoag Army Air Base, APO 919.

6. An interview with Dr. Valdez, Director of the Ilocos Norte Provincial Hospital revealed the possible occurrence of seven cases of paralysis in Filipino infants which was attributed by Dr. Valdez to poliomyelitis. He stated that these cases occurred in May and June of 1945.

Colonel French's final conclusion is also worth quoting:

Increased attention to sanitation is mandatory, particularly early in the course of establishment of an Army Base. Flies, mosquitoes and rodents must be controlled. Native dwellings must be kept at a distance from Army installations and latrine facilities must be made available to native laborers at Army Bases. Screen and DDT must be utilized on latrines, kitchens and mess halls.

China-Burma-India Theater, 1942–45

The statistical health reports list a total of 112 cases of poliomyelitis among American forces for the period 1942 to 1945 with a mean annual attack rate of 0.26 per 1,000, which, however, varied by year from 0.22 to 0.53. For China in 1945, 28 cases are listed, yielding a rate of 0.65 per 1,000 per annum. Col. Herrman L. Blumgart, MC, and Maj. George M. Pike, MC,[22] writing about poliomyelitis in the India-Burma Theater, indicated that cases occurred sporadically during all months of the year with a case fatality rate of 20 to 25 percent. These authors observed:

The incidence of respiratory and/or bulbar involvement in the American military personnel was apparently high * * * The principal problem was the supply and maintenance of the respirators. With sporadic cases occurring at installations thousands of miles apart and often in relatively secluded places, it was imperative to maintain respirators at certain key points in useable condition ready for immediate air transport.

While there are no specific reports on the circumstances under which poliomyelitis occurred among U.S. troops in this theater, it is not unlikely that they were similar to those described in the Philippines. In August 1946, the author had an opportunity to study an explosive outbreak of poliomyelitis (5 paralytic cases with 4 deaths and 25 nonparalytic illnesses) among a battalion of U.S. Marines stationed in the midst of the native population in Tientsin, China. The author was impressed with the abundance of feces on the banks of a recently dredged canal in the vicinity of the barracks and of the ample opportunities which flies had for contaminating the food consumed by the Americans. Brigadier McAlpine strongly stressed the importance of poor sanitation and fecal contamination of food as a factor in the epidemiology of poliomyelitis in British troops in India. He related the strikingly higher incidence among British officers as compared with that in other ranks to the fact that officers' messes are generally catered to by contractors and serviced by native help under poor sanitary conditions. He described an instance of an explosive, apparently foodborne outbreak among officers who stayed for a short time at a private hotel in south India.

---

[22] Blumgart, H. L., and Pike, G. M.: History of Internal Medicine in India-Burma Theater. [Official record.]

Research

Poliomyelitis research during the period 1940–45 was carried on by several members of the Commission on Neurotropic Virus Diseases of the Board of Investigation and Control of Influenza and Other Epidemic Diseases in the Army, although not specifically under Army auspices. The work was concerned predominantly with the systems affected by the virus in human beings, the pathways of excretion, the extrahuman sources of virus in nature, the occurrence of virus in sewage and filth flies, the nature of the experimental disease produced by oral infection, the contamination of food by flies under natural conditions in epidemic areas, and the demonstration that combating flies with DDT from the ground and air after an urban epidemic is well established has little or no effect on the subsequent course of the outbreak. Several strains of virus, including two of the Lansing type, were recovered from military personnel in the Middle East and the Philippines. Material collected in 1945 from military personnel in the Philippines and sent to the New Haven Laboratory of the Neurotropic Virus Commission yielded 10 strains of poliomyelitis virus—5 from the feces of patients with acute cases and 5 from the central nervous systems of individuals with fatal cases.[23] When the methods for definitive immunologic classification of different types of poliomyelitis virus have been worked out, the availability of these strains will permit their comparison with others prevalent in the United States. The laborious methods required for the detection of poliomyelitis virus have precluded any extensive virological investigations of outbreaks in military installations, but the observations on the epidemiological patterns of the disease among the Armed Forces at home and abroad proved to be illuminating.

SUMMARY AND EVALUATION

The total number of cases of poliomyelitis which occurred in the U.S. Army during the period 1942-45 can only be approximated. On the basis of the analysis of individual medical records, which is regarded as the source of the ultimate official statistics, the number of cases in the entire Army for the 4-year period was 1,006, with 267 deaths, representing a case fatality ratio of 26.5 percent. It should be pointed out, however, that the statistical health reports, which contain the preliminary and not necessarily the final diagnosis and which have been the source of previously published statistics on poliomyelitis in the Army, list 1,326 cases for the 4-year period from 1942 to 1945. According to the statistics based on the individual medical records, the attack rate per 1,000 troops per year among those stationed in the United States varied from 0.02 to 0.04 and averaged 0.03. This morbidity rate is of the same order of magnitude as that for civilians of similar age in the United

[23] Letter, Dr. John R. Paul, to Col. Dwight M. Kuhns, MC, Commanding Officer, 19th General Laboratory, 10 Apr. 1945.

States and indicates that the conditions peculiar to Army life in the United States do not involve a greater risk of contracting poliomyelitis.

As a rule, poliomyelitis occurred in the form of isolated cases which were not followed by outbreaks in the units in which they appeared. Only two small outbreaks occurred in Army personnel in the United States, and both were of the explosive, localized type suggesting primary infection from a common source over a limited period of time. Several additional outbreaks which occurred in Navy personnel in the United States were also of the explosive type, occurring under circumstances which strongly suggested that infection was conveyed by some article of food contaminated by a carrier or flies. These outbreaks were self-limited without tendency to spread by contact in other units to which individuals from the epidemic focus may have moved during the incubation period of their disease. Only one outbreak in the United States was characterized by the appearance of groups of cases in waves over a period of 3 months, and this occurred in a California college in which Navy students were in training. However, interestingly enough, no secondary cases could be traced to contacts of the students outside the college. These isolated outbreaks in the United States in which attack rates were as high as 2.5 percent indicated that under special circumstances, perhaps in instances of a particular strain or immunologic type of virus, young adults of military age can be highly susceptible to poliomyelitis. The fact that the mortality in these individual, isolated outbreaks varied from none to 36 percent would suggest that different strains of poliomyelitis virus might also vary considerably in virulence.

Among U.S. troops in the European theater the incidence of poliomyelitis was somewhat lower than among troops stationed in the United States, except for a brief period in 1942, and no outbreaks were recorded. It is also of interest that the special conditions of crowding on troopships were not conducive to the spread of poliomyelitis virus, even when two individuals with cases embarked during the incubation period and developed the disease en route.

The incidence of poliomyelitis among U.S. troops in the Middle East, the Philippines, and China-Burma-India theaters was several times as great as that in the continental United States. The increased incidence was not due to isolated explosive outbreaks, although a few of those occurred, but rather to what appeared as an almost continuously available rich source of the virus. The same unsanitary conditions and proximity to native populations which gave rise to high attack rates of bacillary dysentery, amebic dysentery, and infectious hepatitis also were epidemiologically associated with the increased incidence of poliomyelitis. Poliomyelitis did not occur among troops in the Southwest Pacific Area in New Guinea and in other primitive tropical or subtropical regions where the military installations were beyond the range and influence of native villages. However, within a very short time after

these same troops moved to the Philippines into the midst of congested, native villages and towns with sanitation of the worst possible order, poliomyelitis appeared in unexpectedly high numbers along with the other infections whose etiological agents are known to occur predominantly in human feces. Although the actual number of cases of paralytic poliomyelitis was small by comparison with the incidence of the other infections in this category, it presented many emergency problems in medical management because of the frequent involvement of the muscles of respiration.

CHAPTER XVI

Q Fever

John H. Dingle, M.D., Sc. D.

HISTORICAL NOTE

In 1935 in Australia, Q fever was first recognized in man, and the causative agent was determined to be a rickettsia. In the same year, a rickettsia, subsequently shown to be of the same species as the Australian strains, was isolated by Davis and Cox (p. 402) from ticks of the species *Dermacentor andersoni*, collected along Nine Mile Creek in the State of Montana. For convenience, the history of the work in these two parts of the world will be summarized separately.

The disease in Australia.—Cases of an unusual type of febrile disease were first noted in Queensland, Australia, in 1933. They occurred with increasing frequency during subsequent years, and in 1937 Derrick [1] described the illness in man and reported the transmission of a febrile infection to guinea pigs using as inocula both blood and urine from patients.

The clinical picture in man was characterized by an incubation period of 15 days or less, an acute onset, and symptoms of fever, headache, pains in the back and limbs, malaise, and anorexia. Chilly sensations, occasionally frank chills, jaundice, constipation, vomiting, and abdominal distention were also observed in some patients. Symptoms referable to the respiratory tract were seldom noted. Physical examination was ordinarily not remarkable. The patients appeared acutely, but not seriously, ill. The pulse was relatively slow in relation to the temperature. There was no rash. Only 4 of the 9 individuals with the original cases had cough or rales in the chest. The spleen, lymph nodes, and liver were not enlarged. Total and differential leukocyte counts were within normal limits; urinalysis revealed only slight albuminuria. The course was typified by fever, either sustained at a fixed point or swinging between 102° and 104° F. and falling to normal by lysis. Duration of illness varied between 7 and 24 days, and the patients improved gradually. Relapse was noted in a few instances. By 1940, 3 deaths had been reported among 145 cases.[2]

---

[1] Derrick, E. H.: "Q" Fever, a New Fever Entity: Clinical Features, Diagnosis, and Laboratory Investigations. M.J. Australia 2: 281–299, 21 Aug. 1937.

[2] Cilento, R. W.: Annual Report on the Health and Medical Services of the State of Queensland for the Year 1939–40. Brisbane: Government Printer.

559625v—61——28

Clinical laboratory studies of patients' serums failed to give any evidence that the infection was due to a known bacterium, rickettsia, or virus. However, after Derrick transmitted the infection to guinea pigs, Burnet and Freeman [3] determined that the agent was a rickettsia which Derrick subsequently termed *Rickettsia burneti*. It was pathogenic for guinea pigs, mice, and monkeys and differed immunologically from other known rickettsiae. Convalescent serums from patients specifically agglutinated the organism but did not show agglutinins for *Proteus* OX–19 or OX–K (Weil-Felix reaction).

Extensive epidemiological studies were carried out by the Australian workers in an attempt to elucidate the mode of transmission of the disease. The great majority of the human cases were in abattoir employees, and the remainder were principally dairy and forest workers. Investigation of arthropod vectors showed that certain species of ticks harbored the rickettsia and that others could be infected experimentally. Similarly, bush animals, such as the bandicoot, cows, and dogs, were found either to be susceptible to infection or to be naturally infected. Derrick postulated a basic cycle of infection involving the bandicoot and other bush animals with the ticks *Haemaphysalis humerosa* and probably *Ixodes holocyclus* as vectors. Cattle might interrupt this cycle from the bite of *I. holocyclus*, and a secondary cycle in cattle might be established with *Haemaphysalis bispinosa* as the vector. Human infection might occur from either cycle but was considered more likely from the secondary cattle cycle.

This hypothesis had several gaps, however, and was presented with qualifications. With respect to human infection in particular, there was little or no indication that tick bites were responsible. Since tick feces were known to contain large numbers of rickettsiae, it was suggested that inhalation of dried tick feces from the hides of cattle might be the mode of infection of abattoir workers. Moreover, tick transmission did not explain the infection of laboratory workers that occurred in the course of this work. Both direct contact with infected tissue, and transmission by a mite were suspected but not proved.

The disease in America.—In contrast to developments in Australia, work on the disease in America began with the isolation of the etiological agent from ticks approximately 3 years before the first human case was recognized.

In 1935, at the Rocky Mountain Laboratory, U.S. Public Health Service, Hamilton, Mont.,[4] Davis and Cox isolated a rickettsialike organism from wood ticks of the species *D. andersoni* collected in Montana and later in Wyoming. The agent infected guinea pigs, rats, and mice; was transmitted

---

[3] (1) Burnet, F. M., and Freeman, M.: Experimental Studies on the Virus of "Q" Fever. M.J. Australia 2: 299–305, 21 Aug. 1937. (2) Burnet, F. M., and Freeman, M.: The Rickettsia of "Q" Fever; Further Experimental Studies. M.J. Australia 1: 296–298, 12 Feb. 1938.

[4] (1) Davis, G. E., and Cox, H. R.: A Filter-Passing Infectious Agent Isolated From Ticks. I. Isolation From Dermacentor andersoni, Reactions in Animals, and Filtration Experiments. Pub. Health Rep. 53: 2259–2267, 30 Dec. 1938. (2) Davis, G. E.: Rickettsia diaporica: Recovery of Three Strains From Dermacentor andersoni Collected in Southeastern Wyoming: Their Identity With Montana Strain 1. Pub. Health Rep. 54: 2219–2227, 15 Dec. 1939.

by ticks and passed through the eggs of infected female ticks; was filterable; and grew only in tissue culture and chick embryos. The name "*Rickettsia diaporica*" was proposed for this organism.

During the course of this work at Hamilton, a staff member from the National Institute of Health, U.S. Public Health Service, Bethesda, Md., visited the laboratory and worked there for a few days. Subsequently, he developed an illness very similar to Australian Q fever.[5] From his blood was isolated a rickettsia similar to that being studied in the Hamilton laboratory. The manner of infection could not be determined. This was the first recognized case of Q fever in the United States.

Subsequently, evidence was obtained of natural infection of man in the northwestern part of the United States by isolation of the agent from the blood or by serologic means. Although the rickettsia had been isolated from several species of ticks collected in various parts of the United States, little was known about animal hosts or the manner of spread of the infection in nature. Experimental transmission in the laboratory was possible, however, with additional species of ticks.

In the spring of 1940, the first outbreak of Q fever in the United States occurred among the 153 employees occupying one building at the National Institute of Health.[6] At least 15 cases occurred with one death due to the disease. The diagnosis was confirmed in most of the cases either by isolation of the rickettsia or by serologic methods. Clinically, the study of these cases differed from that of Australian Q fever cases in one important respect; namely, that roentgenographic examinations of the chest were made. Despite the fact that symptoms and signs referable to the lungs were minor or lacking in most of the patients, the X-ray films of 15 of them showed either single or multiple, soft, infiltrating pulmonary lesions. The histopathological picture of the lungs of the individual with the fatal case was one of scattered, small, patchy peribronchial pneumonic areas with purulent exudate in the bronchi and focal necrosis of bronchial and bronchiolar walls. The similarity to primary atypical pneumonia was obvious, and it was for this reason that Q fever was subsequently considered in the differential diagnosis of the cases of atypical pneumonia reported from various parts of the United States at that time and subsequently.

The manner of spread of the infectious agent in the outbreak of the disease at the National Institute of Health was not satisfactorily determined. No cases occurred in the wing of the building where the Q fever work was

---

[5] Dyer, R. E.: A Filter-Passing Infectious Agent Isolated From Ticks. IV. Human Infection. Pub. Health Rep. 53: 2277–2282, 30 Dec. 1938.

[6] (1) Hornibrook, J. W., and Nelson, K. R.: An Institutional Outbreak of Pneumonitis. I. Epidemiological and Clinical Studies. Pub. Health Rep. 55: 1936–1944, 25 Oct. 1940. (2) Dyer, R. E., Topping, N. H., and Bengtson, I. A.: An Institutional Outbreak of Pneumonitis. II. Isolation and Identification of Causative Agent. Pub. Health Rep. 55: 1945–1954, 25 Oct. 1940. (3) Lillie, R. D., Perrin, T. L., and Armstrong, C.: An Institutional Outbreak of Pneumonitis. III. Histopathology in Man and Rhesus Monkeys in the Pneumonitis Due to the Virus of "Q" Fever. Pub. Health Rep. 55: 149–155, 24 Jan. 1941.

being carried on. The sex ratio of the individuals with cases was about the same as that of the employees. There was no evidence of arthropod transmission, and no secondary cases occurred in families. In retrospect, it seems probable that airborne transmission was responsible and that those persons who had been working with Q fever had already acquired inapparent infections and were immune.

Comparative studies of the Australian and American strains.—Comparisons of the Australian and American strains of Q fever *Rickettsiae* were carried out in both countries in considerable detail and with similar results. All of the strains were similar and were distinct from other known *Rickettsiae*. The Australian and American strains were immunologically identical. The animal virulence of the American strains appeared to be slightly greater but showed no qualitative differences. It was concluded that both strains belonged to the same species of *Rickettsia* for which Philip [7] in 1943 proposed the name "*Coxiella burnetii*."

EXPERIENCE IN WORLD WAR II

At the time of the entry of the United States into World War II in December 1941, Q fever was known to relatively few American physicians and was considered by them to be a rare, exotic disease of little or no military importance. Human infection was thought to occur chiefly in Australia where animals also were infected. Although sporadic human cases were known to occur in the Northwestern United States, these cases were considered to be incidental in the tick cycle of transmission of the infection. It was known that the disease in man, acquired in laboratory outbreaks and, perhaps, naturally, might resemble primary atypical pneumonia and that Q fever should therefore be considered in the differential diagnosis of the atypical pneumonias. Knowledge of the epidemiology was uncertain, but tick transmission was considered to be the most likely mode of transmission. No specific treatment was known. Preventive or control measures were likewise unknown, although Cox [8] had proposed a vaccine that was effective in guinea pigs. Laboratory tests for confirmation of the diagnosis, using the specific rickettsial antigen, had been described.

Q fever was not believed to constitute an important problem during the early phases of the war, and consideration of this disease by investigators during this period was primarily on the basis of excluding it as a possible cause of outbreaks of primary atypical pneumonia. Although rickettsial infection was suspected of having been responsible for certain sporadic cases of pneumonia, Q fever was not associated with large outbreaks of primary atypical pneumonia such as those which occurred at Camp Claiborne, La., in the winter of 1941–42.

---

[7] Philip, C. B.: Nomenclature of the Pathogenic Rickettsiae. Am. J. Hyg. 37: 301–309, May 1943.

[8] Cox, H. R.: *Rickettsia diaporica* and American Q Fever. Am. J. Trop. Med. 20: 463–469, July 1940.

Recognition of the Disease

Q fever was first encountered, and recognized as such, during the latter part of World War II, when the disease occurred endemically and epidemically in the Mediterranean area and sporadically in Panama. Investigative work dealing with the disease was carried out by members of various U.S. Army medical units (notably, the 15th Medical General Laboratory at Naples, Italy, and the Office of the Chief of Preventive Medicine of the Mediterranean theater) and later by members of the staffs of the Medical Department Professional Service Schools, Army Medical Center, Washington, D.C., and of the National Institute of Health. The Commission on Acute Respiratory Diseases, Army Epidemiological Board, Preventive Medicine Service, Office of the Surgeon General, also conducted investigations with respect to this disease.

In December 1944, Maj. (later Lt. Col.) John H. Dingle, MC, while on a mission overseas in connection with activities of the Preventive Medicine Service, was informed by Maj. Gen. A. G. Biggam, RAMC, and members of his staff in the War Office in London, that outbreaks of atypical pneumonia had occurred in various units of British troops stationed in the Mediterranean theater. As described, these outbreaks had certain features which appeared to differ from outbreaks of primary atypical pneumonia in the United States in that they were localized to particular military units, were characterized by attack rates as high as 50 percent, and showed an absence of an associated increase in minor respiratory illness. Subsequently, it was learned from U.S. Army medical officers in the Mediterranean theater that the majority of cases of primary atypical pneumonia seen among U.S. troops in the theater differed from those in the United States in that they were milder clinically, showed less pulmonary infiltration roentgenographically, had a greater tendency to occur in local outbreaks, and failed to develop cold hemagglutinins. In addition, there was some evidence that the pathology was different. In the examination of the lungs of nine fatal cases, Lt. Col. Tracy B. Mallory, MC, of the 15th Medical General Laboratory, noticed the absence of the acute necrotizing bronchiolitis and bronchitis which had been considered to be characteristic of the pathology of primary atypical pneumonia.[9]

In February 1945, an opportunity arose to investigate one of these outbreaks in British troops in the Mediterranean theater. At the request of Brig. E. R. Boland, RAMC, Consulting Physician, C.M.F., and with the approval and cooperation of the Office of the Surgeon, MTOUSA (Mediterranean Theater of Operations, U.S. Army), an outbreak in the British 6th Parachute Battalion was studied by Lt. Col. Ross L. Gauld, MC, Major Dingle, and Capt. (later Maj.) Frederick C. Robbins, MC. The infection in this

---

[9] Letter, Maj. J. H. Dingle, MC, Respiratory Diseases Commission Laboratory, to The Surgeon General, U.S. Army, War Department, Washington, D. C., 1 June 1945, subject: Report of an Investigation of Influenza and Other Respiratory Diseases in the European and Mediterranean Theaters of Operation.

organization apparently had been acquired in Athens, Greece. Although the outbreak was subsiding and many of the patients were convalescing at the time of the investigation, the data obtained suggested that the disease differed from primary atypical pneumonia. Subsequently, the disease was identified as Q fever by the laboratory examination of serums from patients and other men in the organization.

During the latter part of February, March, and April 1945, Captain Robbins, and Capt. (later Maj.) F. B. Warner, MC, of the 15th Medical General Laboratory, and Maj. (later Lt. Col.) C. A. Ragan, MC, of the 15th Field Hospital, investigated four similar outbreaks in U.S. troops stationed in northern Italy near Florence and Bologna. Another outbreak, not studied in detail, occurred in troops stationed near Lake Garda. Captain Robbins and his associates at the 15th Medical General Laboratory isolated a rickettsia, subsequently identified as *C. burnetii*, from the blood of some of these patients and demonstrated further that this agent was the cause of the outbreak. In addition, 29 of 49 sporadic cases of an illness diagnosed as atypical pneumonia in Italy were shown actually to be Q fever.[10]

At the time the above studies were begun, in February 1945, Maj. (later Lt. Col.) C. J. D. Zarafonetis, MC, of the United States of America Typhus Commission, learned from Dr. J. Caminopetros of the Pasteur Institute of Greece that an outbreak resembling, but not identical with, influenza had occurred in Athens and its suburbs during the preceding winter. Using the blood of one of these patients, Dr. Caminopetros had established a febrile disease in guinea pigs which was then maintained by guinea-pig passage for the subsequent 13 months. With the approval of Dr. Caminopetros, Major Zarafonetis reported this work and forwarded specimens of infected guinea-pig blood to Brig. Gen. Stanhope Bayne-Jones of the Office of the Surgeon General for study in the United States. The specimens were sent to the Respiratory Diseases Commission Laboratory [11] at Fort Bragg, N.C., where the agent was identified as *C. burnetii* and termed the Balkan grippe strain.

In August 1945, Col. Garnett Cheney, MC, and Maj. (later Lt. Col.) W. A. Geib, MC, isolated in guinea pigs a rickettsia from the blood of a patient with an illness diagnosed as atypical bronchopneumonia in Panama. This agent was identified at the National Institute of Health as a strain of *C. burnetii*.

In May and June 1945, an outbreak of respiratory disease occurred among troops in transit from Grottaglie in southern Italy to Camp Patrick Henry, Va., and other ports of debarkation in the United States. Investigation of

[10] (1) Robbins, F. C., and Ragan, C. A.: Q Fever in the Mediterranean Area: Report of Its Occurrence in Allied Troops. I. Clinical Features of the Disease. Am. J. Hyg. 44: 6–22, July 1946. (2) Robbins, F. C., Gauld, R. L., and Warner, F. B.: Q Fever in the Mediterranean Area: Report of Its Occurrence in Allied Troops. II. Epidemiology. Am. J. Hyg. 44: 23–50, July 1946.

[11] The professional staff of the Respiratory Diseases Commission Laboratory was as follows: Maj. John H. Dingle, MC, Director; Maj. Theodore J. Abernethy, MC; Maj. George F. Badger, MC; Maj. Norman L. Cressy, MC; A. E. Feller, M.D.; Irving Gordon, M.D.; Maj. Alexander D. Langmuir, MC; Charles H. Rammelkamp, Jr., M.D.; and Capt. Elias Strauss, MC.

the cases at Camp Patrick Henry and of other aspects of the outbreak was carried out by Maj. Marcus A. Feinstein, MC, Capt. Raymond Yesner, MC, and Maj. Jerome L. Marks, MC, of the station hospital and by members of the staff of the Respiratory Diseases Commission Laboratory. Roentgenograms of the chest were used in the study of this outbreak as a method of case findings. Although rickettsiae could not be isolated from these patients, the disease was identified serologically as Q fever.

Laboratory outbreaks of Q fever occurred among the personnel of the 15th Medical General Laboratory and of the Respiratory Diseases Commission Laboratory during the course of these investigations. The agents responsible were shown to be the so-called Italian and the Balkan grippe strains of *C. burnetii*, respectively.

Thus was Q fever recognized and identified as the cause of sporadic and epidemic cases of atypical pneumonia in the Mediterranean area and in Panama. In the process, new strains of *C. burnetii* were obtained and subsequently characterized. In all probability, Q fever occurred in U.S. troops in other parts of the world during World War II but was not definitively recognized.

Occurrence in Military Forces

Statistical data regarding the occurrence of Q fever in U.S. military forces during the war are nonexistent, probably for the following reasons: Until the latter part of the war, the disease was not recognized, if indeed it occurred, and therefore was not suspected; differentiation of this disease from primary atypical pneumonia clinically was difficult, if not impossible, and laboratory confirmation was required; and it occurred sporadically or in focal outbreaks in limited geographic areas. The most that can be stated in retrospect is that Q fever in northern Italy may have accounted for as many as 75 percent of the cases diagnosed as atypical pneumonia in certain Army hospitals and that the total attack rates in military units experiencing focal outbreaks reached levels as high as 20 or 30 percent of their strength.

Data regarding the true occurrence of Q fever are too inadequate to permit a determination of the extent to which this disease constituted a military problem during the war. It is reasonable to believe that this infection was the cause of considerable illness and loss of time among the troops in the Mediterranean area. Only one unit in Italy, the 3d Battalion, 362d Infantry Regiment, is known to have suffered an outbreak while in combat.[12] The epidemic bgan 4 days after the unit of approximately 900 men had moved back into the line from the rest area. In the next 3 weeks, 269 men, or almost 30 percent of the unit, were hospitalized. The potential military importance of this disease in its epidemic form is thus apparent.

---

[12] See footnote 10(2), p. 406.

Knowledge Acquired Through the War

The several studies of Q fever during the war so extended knowledge of the behavior and extent of this disease that it could no longer be considered as a medical curiosity. Careful analyses of the clinical aspects of the naturally occurring cases, as well as of laboratory-acquired infections, confirmed the prewar descriptions and the extremely low mortality.[13] In addition, these studies emphasized both the variation that may occur in clinical severity and the high frequency of pulmonary infiltration.

With respect to the epidemiology of Q fever, the studies and observations made during World War II added several geographic areas to the known distribution of the disease. These were principally the countries of Italy and Greece and the island of Corsica in the northern Mediterranean region and Panama in Central America. Supportive evidence was obtained that the disease had occurred endemically and epidemically in various parts of Bulgaria and Greece since 1941. The endemic and epidemic occurrence of Q fever in Italy and its sporadic occurrence in Panama were clearly established.

The source of infection and mode of transmission of the naturally occurring disease were not determined. Neither animal reservoirs nor arthropod vectors were clearly associated with the epidemics. In many instances, the outbreaks were sufficiently explosive to suggest a single exposure and a common source such as contaminated food or water. No evidence was obtained to support such an explanation. All of the epidemics were focal in character, and some were associated with particular places, such as barns or houses, or with straw or hay, yet the manner of transmission could not be found. There was no evidence pointing to spread of the disease by person-to-person contact. The inhalation of infected dust or other particles could not be excluded and remained as an attractive possibility, particularly by analogy to outbreaks in the laboratory, where transmission was presumably by air.

Measures for prevention and control of Q fever were not applied and, indeed, were not available because of lack of knowledge of the natural history of the disease. Isolation of cases and quarantine of contacts were not indicated because the disease seldom spread from person to person. Since the mode of spread was unknown, attempts to interrupt or break the chain of transmission could not be made. Immunization of guinea pigs with a rickettsial vaccine had been accomplished, but no attempts to immunize human beings had been made. Immunization of troops against Q fever was not attempted.

Laboratory confirmation of the diagnosis of Q fever was possible by isolation of the rickettsia in animals or embryonated eggs and by serologic

---

13 Robbins, F. C.: Q Fever, Clinical Features. *In* Rickettsial Diseases of Man. Washington: Am. Assoc. Advancement Sc., 1948, pp. 160–168.

tests. Improved techniques were developed,[14] and the use of the highly reactive Italian strain (Henzerling) as an antigen for serologic tests greatly facilitated such work.[15]

SUMMARY AND EVALUATION OF THE FUTURE IMPORTANCE OF Q FEVER

During World War II, the status of Q fever changed from that of a little-known, possibly exotic disease to that of a disease of considerable importance in certain highly endemic areas. The investigations of Q fever carried out by members of various U.S. Army medical units and by others extended considerably the knowledge of the clinical behavior of the disease, particularly with respect to the high frequency of pulmonary involvement. However, no effective method of therapy was found. Two widely separated geographic areas were added to the known distribution of Q fever; namely, the northern Mediterranean region and Panama. Laboratory methods for confirming the clinical diagnosis were improved, particularly by the discovery of strains of *C. burnetii* which were more highly reactive antigenically than those previously known. The reservoir of infection and the mode of transmission were not defined, nor were measures of prevention and control developed.

The years immediately following World War II witnessed a great extension of knowledge regarding Q fever from which it is apparent that this disease is one of considerable potential military importance. Definitive or presumptive evidence has been presented of the existence of the disease in Australia, the United States, Panama, Mexico, England, Wales, Spain, Portugal, Switzerland, France, Germany, Rumania, Yugoslavia, Greece, Turkey, Iraq, Israel, Morocco, Algeria, Libya, the Belgian Congo, French Equatorial Africa, the Union of South Africa, India, and China. Possible reservoirs and hosts include at least 17 species of ticks, the body louse, cow, sheep, goat, bandicoot, and pigeon. The milk and the placentae of infected cows, sheep, and goats may be heavily contaminated; the urine and feces also of these animals may occasionally be heavily contaminated. Thus, the environment of infected domestic animals may become heavily contaminated, and the contamination may persist for weeks because of the extraordinary resistance of *C. burnetii* to drying and to heat.

---

14 (1) Bengtson, I. A.: Complement Fixation in the Rickettsial Diseases: Technique of the Test. Pub. Health Rep. 59: 402–405, 24 Mar. 1944. (2) Gallenson, N.: Hypertonic Sodium Chloride Solution as Serum Diluent in Agglutination Tests With Rickettsia Burneti. Proc. Soc. Exper. Biol. & Med. 63: 169–171, October 1946.

15 (1) Robbins, F. C., Rustigian, R., Snyder, M. J., and Smadel, J. R.: Q Fever in the Mediterranean Area: Report of Its Occurrence in Allied Troops. III. The Etiological Agent. Am. J. Hyg. 44: 51–63, July 1946. (2) Topping, N. H., Shepard, C. C., and Huebner, R. J.: Q Fever: An Immunological Comparison of Strains. Am. J. Hyg. 44: 173–182, July 1946.

Although many questions remain regarding the epidemiology of Q fever, it now appears that most human infections arise in association with animals and their environment, some arise from the drinking of raw milk, and rare cases may follow the bite of an arthropod vector or patient-to-patient transmission. The respiratory tract appears to be the most common portal of entry in man, and the inhalation of contaminated dust probably is the mode of infection.

Effective and specific therapy can probably be obtained with one of the broad-spectrum antibiotics (Aureomycin, chloramphenicol, and Terramycin), although further evaluation is desirable because of the variability of the clinical disease. Preventive and control measures need further investigation. Pasteurization of milk and milk products is obviously indicated. Vaccination appears to have been effective on a small scale but needs evaluation on a larger scale before it can be employed militarily. The possibilities of chemoprophylaxis also require investigation.

CHAPTER XVII

Viral Hepatitis

John R. Paul, M.D., and Horace T. Gardner, M.D.

EVOLUTION OF CONCEPTS OF HEPATITIS

The story of hepatitis in World War II will not soon be forgotten. The dramatic impact of this disease on U.S. troops was heightened by the fact that, at the outbreak of war, little of a specific nature was known in the United States about viral hepatitis, either as a military disease or as a common civilian disorder.

Until the year 1942, there was relatively little appreciation of the fact that there may be two forms of hepatitis, the so-called infectious hepatitis and serum hepatitis. Whether the differences in these two forms are due to two viruses or to varieties of the same virus is still a moot point in some circles, but the question is not discussed in this history. It is sufficient to state that considerable experimental evidence indicates that there is a difference in these two agents in the human host and that their modes of transmission may differ, however indistinguishable clinically these two diseases may be. Infectious hepatitis and serum hepatitis are discussed separately for this reason and also because they confronted the U.S. Army essentially in separate epidemics; namely, (1) the great epidemic of serum hepatitis of 1942, transmitted by the inoculation of infected serum incorporated in yellow fever vaccine and (2) extensive epidemics of infectious hepatitis in the Mediterranean and Middle East theaters during the years 1943–45 and in the European and Pacific theaters mainly in 1945.

Actually, the first of these epidemics, that of serum hepatitis, fell upon the troops like another unsuspected bombshell within 4 months of Pearl Harbor, and viral hepatitis proved to be a scourge to the Army throughout the remaining years of the war and long after the end of hostilities.

How did it happen that the impact of this disease on the Army was unexpected? The answer probably lies in the fact that hepatitis had not been a significant problem to U.S. troops during World War I and the overall plans laid in 1941 for dealing with infectious disease were modeled largely on experiences of the Medical Department in the previous war.

It should be pointed out, however, that early in 1941 the Preventive Medicine Service in the Office of the Surgeon General had established a planning and investigative board, designed to investigate and control both

the known epidemic diseases and those which might eventuate. This board was originally known as the Board for the Investigation and Control of Influenza and Other Epidemic Diseases in the Army. It was approved by the Secretary of War in January 1941 and subsequently became known as the Army Epidemiological Board. It is not surprising that no separate commission on hepatitis (p. 411) was established, for at that time no one could have foretold the importance which this disease was to assume, and most physicians (both military and civilian) did not appreciate its potential military importance or, indeed, its seriousness as a common disorder among civilians. What then were the views current in 1940 about hepatitis in the United States?

It would be presumptuous for any one or two persons to attempt to state the general concept of the medical profession in the United States in 1940 in regard to hepatitis. However, one can either do this or offer no review of the prewar situation at all, and perhaps the former is the lesser of two evils. It is the authors' impression that during the 1930's most physicians in the United States recognized an epidemic form of mild jaundice, which was distinct from Weil's disease but was ill-defined, uncommon, and probably different from the common sporadic disease known as catarrhal jaundice. This idea was held despite the fact that there was good evidence in Europe, England, and, indeed, in the United States that epidemics of mild jaundice were not rare and that epidemic and sporadic (or catarrhal) jaundice might, on occasions, be the same disease. However, the latter assumption was not particularly acceptable, and understandably so, because in the 1920's and 1930's many physicians believed that epidemic jaundice was a diffuse hepatitis often due to a spirochete such as the causative agent of Weil's disease, and that catarrhal jaundice, the sporadic disease, was an obstructive jaundice, said to be the result of a primary inflammation of the bile ducts and quite different in its pathology, prognosis, and clinical picture.

This view was held despite the fact that there was also good clinical and epidemiological evidence in medical publications that it was incorrect. Blumer[1] had been among the first in this country to uphold the idea that catarrhal jaundice probably was the sporadic form of infectious hepatitis. His evidence, presented in 1923, was excellent, but his views were not generally accepted for some 20 years. Blumer had been preceded in turn by Cockayne in England, who had published (Quart. J. Med. 6:18, October 1912) a historical review with a comprehensive title, "Catarrhal Jaundice, Sporadic and Epidemic, and Its Relation to Acute Yellow Atrophy of the Liver," in which the unity of these conditions was stated prophetically in no uncertain terms. Cockayne's views also received little attention for a generation. Apparently, the reason for considering catarrhal jaundice to be a distinct entity, despite its unknown etiology, was that its name implied that the pathogenesis of this type of jaundice was an inflammation and catarrh of the biliary tract, particularly the common duct, which at the height of the disease might be

[1] Blumer, G.: Infectious Jaundice in the United States. J.A.M.A. 81: 353–358, 4 Aug. 1923.

blocked by a mucous plug. So strong was this view that one school championed the idea that a rational, direct, and effective method of therapy was the removal of this plug of inspissated mucus "corking" up the ampulla of Vater, by the introduction of magnesium sulfate into the duodenum. This concept, that is, that the pathology of catarrhal jaundice developed from an extension of a gastroduodenitis upward into the terminal portion of the bile ducts causing edematous swelling and congestion with an increased production of mucus in the common bile duct, was still widely accepted in 1940. This is not surprising, for the concept had had strong backing for some 60 or 70 years.

The great pathologist, Virchow [2] had ascribed one common form of jaundice to a mucus plug in the ampulla of Vater resulting from "catarrh" which could arise from a multiplicity of causes, the so-called katarrhalische Gelbsucht.[3] This idea had been carried down through successive editions of many textbooks of medicine, including Osler's influential text, for almost two generations. But the concept of the plug as an etiological agent had been challenged since the early 1920's. Thus, Eppinger,[4] in Vienna, was the first to suggest that the pathogenesis of catarrhal jaundice was due rather to a hepatocellular necrosis. Eppinger's views were later upheld by Rich [5] who reported in 1930 that, in the records of 11,500 autopsies performed at the Johns Hopkins Hospital during 40 years, there was not a single case in which the diagnosis of catarrhal jaundice could be regarded as accurate. Thus, it seems that the concept of the pathogenesis of the clinical entity known then as catarrhal jaundice had been based, correctly perhaps, on the existence of a primary duodenitis but that it had gone beyond the facts in suggesting that the jaundice was obstructive. Actual firsthand observations of this obstruction are few because patients seldom die with the diagnosis of catarrhal jaundice or, at least, pathologists have seldom confirmed the diagnosis. That such an entity as catarrh of the bile ducts exists, few would deny, but that it is the cause of most cases of sporadic jaundice which have gone under the name "catarrhal jaundice" seems most unlikely. Therefore, it appears in retrospect that catarrhal jaundice was more of a clinical than a pathological concept and that the vast majority of cases so called in reality included examples of either sporadic infectious hepatitis or serum hepatitis.

Epidemic jaundice, so-called icterus epidemicus, is an old disease said to have been recognized even in Hippocratic times. It has had a long military history, and accounts of epidemics of this disease have been recorded in Germany and elsewhere in Europe since the middle of the 18th century. From a

---

[2] Virchow, R.: Ueber das Vorkommen und den Nachweis des Hepatogenen, Insbesondere des Katarrhalischen Icterus. Virchows Arch. f. path. Anat. 32: 117–125, 1865.

[3] Virchow had been anticipated in this explanation by others beside Bamberger. Donald Monro (p. 415) in 1764, in his discussion of jaundice, stated: "This disorder (jaundice) * * * sometimes takes its rise from a viscid Mucus or Pituita obstructing these passages."

[4] Eppinger, H.: Die Pathogene des Ikterus. Verhandl. d. deutsch. Gesellsch. f. inn. Med. 34: 15–39, 1922.

[5] Rich, A. R.: The Pathogenesis of the Forms of Jaundice. Bull. Johns Hopkins Hosp. 47: 338–377, December 1930.

historical standpoint it has not always been easy to recognize what disease is meant by the term "icterus epidemicus." The serious form of icterus epidemicus, subsequently designated as Weil's disease, was differentiated on clinical grounds in 1886, although the discovery by Japanese workers of the spirochetal etiology of Weil's disease was not made until 1914. This discovery left its mark. It so influenced Noguchi that he shortly announced his belief that yellow fever was due to a leptospira. In any event, the influence of this discovery was such that the term "infectious hepatitis," or "epidemic jaundice," became for the time being synonymous with Weil's disease, and for a period of about 20 years (during the 1920's and 1930's) most important American textbooks of medicine eliminated from their lists of diseases the term "infectious hepatitis," including it instead under the title, "Weil's disease" or "leptospirosis."

Indeed, an understandable tendency still exists to confuse the mild form of epidemic jaundice, now known as infectious hepatitis, with Weil's disease. Perhaps this confusion may be attributed in part to the fact that, during the period 1920–45, there were erroneous reports of finding leptospira in the blood of patients in a variety of types of clinical cases of jaundice. Laboratory workers in civilian and military hospitals may be easily led astray by the finding of artifacts in the blood which can bear an uncanny resemblance to a living spirochete. This was a common error in a number of military hospitals during the early years of the war. However, a differentiation of Weil's disease from the disease we now know as infectious hepatitis can be made when good laboratory facilities are available, though it may, of course, be difficult under other conditions. Recent reports indicate that clinical differentiation on the basis of leukocytosis and albuminuria are not always dependable and that the most reliable diagnosis of Weil's disease may be made by leptospiral agglutination to various strains of the organism, since variability in the susceptibility of guinea pigs makes animal inoculation and subsequent dark-field examination occasionally unreliable.

Today, it is realized that the two diseases, infectious hepatitis and leptospirosis (Weil's disease), are quite different, and it is of prime importance to differentiate them. Weil's disease is rare in some parts of the world where infectious hepatitis is common. During 1944–45, about 60 cases of Weil's disease were reported in the total Army; 10 in continental United States, 20 in Europe, 5 in the China-Burma-India theater, and 25 in the Pacific.

This, then, was the rather confused concept with which the authors believe infectious hepatitis was regarded by physicians in this country during the prewar period and the early years of World War II.

HISTORICAL NOTE

Epidemic hepatitis is an old and ugly camp follower. Over and over again, accounts of it appear, written by military surgeons attached to the armies which fought back and forth across Europe in the 18th and 19th cen-

turies. During the Seven Years' War, the disease occurred in armies in the field in Germany and in the Low Countries, where it was described by Pringle [6] and Monro.[7] The disease in a British garrison at Malta was described by Cleghorn.[8] Hirsch [9] lists a number of these epidemics in the 19th century among German as well as other European troops from 1842 to 1856, and they are thoroughly discussed by Fröhlich [10] who reported some 30 epidemics, 4 of which he had studied himself. So common was this disease in Germany among both garrison and field troops that it became known as Kriegsikterus, Kriegsgelbsucht, or Soldatengelbsucht, just as it had been known among the French from the time of the Napoleonic Wars as the jaunisse des camps. During Napoleon's Egyptian campaign, the French Army had a severe epidemic which was described by the Baron Larrey,[11] whose avuncular relationship to the organization of the U.S. Army system of evacuation in the field is well known because of his influence on Jonathan Letterman.

U.S. wars, 1840–66.—Among U.S. troops, the best known early record is that of the Civil War, and the story of jaundice (hepatitis) among Union troops in that war is familiar to many students of American medical history. However, before the Civil War (1861–66), there already was evidence that hepatitis had been a problem in the U.S. Army. The nomenclature used was far from specific, but, during the period between 1840 and 1859, which includes the years of the Mexican War, 350 cases of "Hepatitis acuta" and 8 deaths due to this disease had been recorded. During the same period, 7 deaths due to "icterus" had been recorded.[12]

During the Civil War, this troublesome question of nomenclature again appears. How many of the cases of jaundice described as occurring among the Union troops were actually due to infectious hepatitis and how many to other causes is unknown, and of this fact that medical officers recording the medical history of the Civil War were well aware.[13] They state: "Jaundice occurred frequently in the progress of the malarial and other fevers as the result of morbid changes affecting the liver or the blood." They also observe: "There were, however, a large number of hepatitic and haematemic disorders in which the alteration of the color constituted so prominent a symptom that

---

6 Pringle, John: Observations on the Diseases of the Army in Camp and Garrison. 6th ed. London: A. Millar and T. Cadell, 1768.

7 Monro, Donald: An Account of the Diseases Which Were Most Frequent in the British Military Hospitals From January 1761 to the Return of the Troops to England in March 1763. London: Millar, Wilson, and Durham, 1764.

8 Cleghorn, George: Observations on the Epidemical Diseases in Minorca, From the Year 1744 to 1749. London: D. Wilson, 1751, p. 281.

9 Hirsch, August: Handbook of Geographical and Historical Pathology. London: The New Sydenham Society, 1886.

10 Fröhlich, C.: Ueber Icterusepidemien. Deutsche Arch. f. klin. Med. 24: 394–406, 1879.

11 Larrey, D. J.: Relation Historique et Chirurgical de l'Expedition de l'Armée d'Orient en Egypte et en Syrie. Paris: Demonville et Soeurs, 1803.

12 Statistical Report on the Sickness and Mortality in the Army of the United States, 1855–1860. Ex. Doc. No. 52, 36th Cong. 1st sess., p. 322.

13 Medical and Surgical History of the War of the Rebellion. Medical History. Washington: Government Printing Office, 1888, pt. III, vol. 1, pp. 874–879.

the disease was recorded under the heading of jaundice. No less than 71,691 cases of this kind were reported among the white troops."

Generally, these military cases of jaundice were sporadic, but sometimes a series occurred in a command, constituting a local epidemic which was frequently associated with an outbreak of continued fever, the jaundice sometimes preceding the appearance of fever and sometimes following its subsidence. The evidence that many, if not the great majority, of these cases of jaundice were, in all probability, infectious hepatitis can be inferred from the records of the variation in the seasonal prevalence of jaundice as recorded in the white and Negro troops in the Atlantic and Central regions for the Union Army during the period from July 1862 to June 1866. These rates, which range from less than 1 to over 13 per 1,000, recall the seasonal incidence of viral hepatitis in U.S. troops in Europe during World War II, some 80 years later, that is 1944–46, where there was a characteristic rise in the infectious hepatitis cases during the late summer and fall. The high rates during certain seasons recorded in the Union Army in the Civil War probably reflect the local epidemics mentioned above. Specifically, they were recorded for white and Negro troops in the Atlantic region for the autumn of 1863 and in both the Atlantic and Central regions for 1865; rates reached 13.25 per 1,000 in November 1863 and 7.75 per 1,000 in August 1865. Several autopsy records of fatal cases are described in the medical history of the Civil War, and the picture of acute atrophy of the liver given therein is indeed compatible with that of infectious hepatitis.

U.S. experience, World War I.—In considerable contrast is the story of infectious hepatitis during World War I. Epidemic or infectious hepatitis did not appear to be, or at least was not regarded as, a problem of any significance for the U.S. Army, although the same cannot be said of the British or the French armies, particularly of their troops at Gallipoli. In the medical history of the U.S. Army during World War I, infectious jaundice is dismissed with 13 lines. The term "infectious jaundice" was at that time a synonym for Weil's disease. The statement is made under the heading Infectious Jaundice that the cause is a spirochete. The U.S. Army reported 452 admissions for spirochetal jaundice and 15 deaths due to the disease during World War I. This total included 35 officers. The geographic distribution of the remaining 417 cases was as follows: The United States, 279; Europe, 108; the Philippine Islands, 15; Panama, 9; other countries, 5; and transports, 1. To the 452 original admissions must be added 80 instances in which the same malady occurred concurrently with other disease admissions among enlisted men in the United States and Europe making a grand total of 532 cases. It would seem at first thought that the U.S. Army had been remarkably fortunate in escaping outbreaks of infectious hepatitis in World War I, but, as a matter of fact, in retrospect one might question whether or not it really was good fortune. Had the Army had even a little more experience

with this disease, it is possible that more extensive preparations would have been made for its occurrence in World War II.

British and French experiences, World War I.—During World War I, epidemic catarrhal jaundice or infective hepatitis broke out among British troops in Alexandria in July 1915 and rapidly spread to Gallipoli, Moúdhros, Thessaloníki, and Mesopotamia. As an example of its severity, from the 13th British Division at Anafarta Limani, 555 cases occurred in June alone in 1916. Spirochetal jaundice was definitely excluded. It was noted by the British that the peak of the jaundice outbreak occurred about 3 weeks after the summit of the dysentery curve was reached and that a recent history of diarrhea was common in the hepatitis cases. Willcox,[14] who reported on the epidemics in the Dardanelles, made the following observations: "The epidemic jaundice of campaigns appears to start as a gastrointestinal infection, * * * and is almost certainly conveyed by the alimentary tract and contamination of food with infective dust probably plays a most important part in the causation. Flies also * * * may convey infection to food; but they are probably not the main cause of the spread of the disease." He also incriminated water as a possible source of infection. Even though his epidemiological evidence was based mainly on rather fragmentary data, a lesson is implicit here in regard to this disease and to others: That it is profitable to examine and investigate theories of transmission in infectious disease held by those with field experience even though the experimental evidence is scanty. It was not, of course, until World War II that Voegt,[15] in Germany, and workers in England and the United States (p. 435) were able to establish that the disease could be transmitted by feeding infected stools, and the first experimental evidence of waterborne infectious hepatitis was reported by Neefe and Stokes in 1945.[16]

Epidemic jaundice also occurred among French troops in the Dardanelles where an attempt to associate it with salmonellal infections was made, a relationship which has not yet been completely clarified. There were very extensive epidemics of this disease among both German and Rumanian troops in Rumania in 1917.

In none of these epidemic areas such as the eastern Mediterranean, the Middle East, or the Balkans, were U.S. troops stationed during World War I. However, a mild epidemic of epidemic jaundice did occur among U.S. troops in 1918 in the Army of Occupation on the Rhine.

In brief, then, there was in World War I extensive British, French, German, and Rumanian experience with large epidemics of infectious hepatitis,

---

14 Willcox, W. H.: The Epidemic Jaundice of Campaigns. Brit. M.J. 1: 297–300, February 1916.

15 Voegt, H.: Zur Aetiologie der Hepatitis Epidemica. München. med. Wchnschr. 89: 76, 23 Jan. 1942.

16 Neefe, J. R., and Stokes, J., Jr.: An Epidemic of Infectious Hepatitis Apparently Due To a Water Borne Agent. J.A.M.A. 128: 1063–1075, 11 Aug. 1945.

particularly in certain special areas such as Egypt, Mesopotamia, the Dardanelles, and the Balkans, an experience which the U.S. Army did not share.

There is little indication that serum hepatitis had ever played any part in military medical history before World War II, unless one counts the experiences in the 1920's and 1930's which the Germans encountered in their salvarsan clinics. "Salvarsangelbsucht" was particularly noted by Ruge [17] in the German Navy, and received rather special and prolonged attention from him, as will be discussed later (p. 420).

U.S. troops during period between world wars.—During the period between World War I and World War II, infectious hepatitis in the Army both within and without the continental United States probably occurred at about the same rate as it did in the civilian population of the United States. Because the disease was not reportable, the incidence in civilians is not known. That it was regarded as being of no great significance in the U.S. Army may be seen from the fact that before 1939 it was reportable not as an entity but under "spirochetal hemorrhagic jaundice," under "other protozoal diseases," or under "other disease of the gallbladder and biliary passages" and until 1943, when the first single code for infectious hepatitis was provided, was variously reported or coded as "spirochetal jaundice," "cholangitis," or "other disease of the gallbladder and biliary ducts." Table 44 shows the approximate admission data for hospitalized cases of cholangitis in the U.S. Army between 1931 and 1942.

TABLE 44.—*Admissions and admission rates for cholangitis in the U.S. Army, by year, 1931–41* [1]

[Rate expressed as number of admissions per annum per 1,000 average strength]

Year	Admissions	Rate	Year	Admissions	Rate
1931	273	2.02	1937	263	1.50
1932	305	2.31	1938	318	1.74
1933	251	1.84	1939	370	1.93
1934	250	1.86	1940	549	1.63
1935	234	1.64	1941	1,611	1.20
1936	269	1.63			

[1] Data for the years 1931 through 1938 are for "Other diseases of gallbladder and biliary passage" which included, in addition to cholangitis, a very few cases of adhesions of gallbladder, stricture of gall ducts, and other diseases of gallbladder.

Summary.—In 1941, the likelihood of infectious hepatitis and serum hepatitis becoming epidemic diseases of potential danger to U.S. troops seemed extremely remote. Serum hepatitis was practically unknown as a military disease. Throughout the medical profession in this country the concept of infectious hepatitis had received scant attention, and there was not a little misinformation about it in widely used texts. On the other hand, in 1940 the

[17] Ruge, H.: Zehn Jahre Gelbsucht in der Marine (1919–1929), Beobachtungen an 2500 Fallen. Ergebn. d. inn. Med. u. Kinderh. 41: 1–112, 1931.

British troops had already begun to experience epidemics of hepatitis in their troops in North Africa, and there was actually, at the same time, a considerable amount of correct and important information about infectious and serum hepatitis available in medical literature which was not to be generally realized or perhaps appreciated in this country until early in 1942.

THE SERUM HEPATITIS EPIDEMIC OF 1942

It was only a few months after the declaration of war in December 1941 that the most extensive outbreak of serum hepatitis ever to be recorded in military history broke out among U.S. troops both in the United States and abroad. This outbreak of "jaundice" in the Army, which began in February 1942, was the cause of great concern to the Medical Department and particularly to the Preventive Medicine Service, Office of the Surgeon General. Not the least of its disconcerting features was the fact that it was so unexpected, and also that some 4 or 5 weeks elapsed before there was general acceptance of the fact that it was actually homologous serum jaundice following vaccination for yellow fever and perhaps not due to attenuated yellow fever virus.[18]

In brief, the events were as follows: In February 1942, an increased incidence of jaundice in the Army of the United States was reported to the Preventive Medicine Service of the Office of the Surgeon General. By March it was evident that a widespread epidemic was imminent, and it was soon apparent that the epidemic was not limited to the continental United States but was occurring simultaneously in troops in such widely separated regions as Hawaii, the Southwest Pacific, Alaska, Iceland, and England. For 4 or 5 weeks, the nature of this outbreak was in doubt, but data submitted by a team of the Army Epidemiological Board seemed conclusively to exclude toxic agents or contacts with infected civilians as causes and established statistically a causal relationship between the administration of certain lots of yellow fever vaccine which had been given 2 or 3 months previously. On the basis of this information and an analysis of reports from various affected units, The Surgeon General, on 15 April 1942, discontinued the administration of serum-containing yellow fever vaccine. At that time it seemed possible that an icterogenic agent, perhaps the unknown cause of infectious hepatitis, had been introduced into the vaccine by way of the human serum used in its preparation. Subsequently, this was abundantly proved. A serum-free vaccine was substituted in April 1942, and no jaundice that was proved to be associated with yellow fever vaccination, per se, developed subsequently in recipients of this vaccine.

Although hindsight is infinitely and prosaically clearer than foresight, it is perhaps not too hard today to understand why there was so much diffi-

---

[18] For certain sections of this account, particularly those dealing with the facts which led to discontinuance of the icterogenic yellow fever vaccine, the authors are especially indebted to Brig. Gen. Stanhope Bayne-Jones and to Dr. Kenneth F. Maxcy.

culty in determining the origin and nature of this outbreak of serum hepatitis. A review of the diagnostic problems is instructive. Serum hepatitis, or syringe hepatitis, had never occurred or been recognized before as a problem in the U.S. Army or in any army. Civilian outbreaks of postvaccinal or postinoculation hepatitis, although recorded, had not received much attention in the United States before 1942, because the literature on this subject had either been published largely in England and elsewhere abroad or at least had dealt with populations which had been inoculated abroad. The serum-containing menstruum of the yellow fever vaccine, which came under suspicion in February 1942, had been heated to 56° C. and was therefore considered free of contaminants. This led to a false sense of security because it was not generally appreciated then that the virus of serum hepatitis is more thermostable than most well-known viruses pathogenic for man.

Historical Background

It may be wise to review at this time the prewar history of serum hepatitis. Probably the first example of postvaccinal, or needle, hepatitis was the epidemic observed by Lürman [19] in Bremen from October 1883 to April 1884. Among 1,200 to 1,500 workmen employed in a shipyard during this period, there were approximately 200 cases of jaundice, while in Bremen itself during the same period there were very few sporadic cases of jaundice. Lürman found that during a period of 19 days, 1,289 workmen had been vaccinated with human glycerinized lymph. Within a few weeks, 191 of these men became jaundiced while none of 500 men vaccinated with a different lymph at the same time acquired jaundice. After concluding it was due to "bad lymph," Lürman remarked on the rather unusual fact that the incubation period was prolonged from several weeks to even a couple of months. Here is perhaps the first description of the artificial inoculation of hepatitis.

This was followed in the same year by a report by Jehn [20] of another such outbreak in Germany occurring in Merzig. Here, five different groups were vaccinated by four different doctors using lymphs from five different sources. In one group, more than 25 percent of those vaccinated contracted hepatitis; in others, the percentage was much lower. The incubation period was from 2 to 8 months, which is suggestive of the long incubation period of serum hepatitis. The episodes in Germany were apparently regarded as curiosities, and their significance was forgotten for many years. In fact, it was not until 36 years later that Dr. John H. Stokes,[21] at the Mayo Clinic, Rochester, Minn., regarded the jaundice which had occurred in a group of patients undergoing antisyphilitic treatment as being due to infectious jaundice. Dr. Stokes believed, as did Ruge in Germany 5 years later, that catarrhal jaundice and

---

19 Lürman, A.: II. Eine Icterusepidemic. Berl. klin. Wchnschr. 22: 20–23, January 1855.

20 Jehn —.: Eine Icterusepidemie in wahrscheinlichem Zusammenhang mit vorausgegangener Revaccination. Deutsche med. Wchnschr. 11: 339–340, 354–356, May 1885.

21 Stokes, J. H., Ruedemann, R., Jr., and Lemon, W. S.: Epidemic Infectious Jaundice and Its Relation to the Therapy of Syphilis. Arch. Int. Med. 26: 521–543, November 1920.

salvarsan icterus represented the same entity. Both syphilologists presumed that either the luetic infection or its treatment were factors predisposing to the acquisition of the hepatitis that followed the type of intravenous therapy then employed. Neither Stokes nor Ruge actually regarded the needles or syringes with which treatments were given as potential means for the transfer of the infection.

In 1926, however, a remarkable paper by Flaum, Malmros, and Persson [22] anticipated almost all of our present concepts regarding the transmission of infectious hepatitis. Describing an epidemic of hepatitis which occurred among patients in a diabetic clinic, they not only implicated the syringe and needle in the transfer of the disease but even suggested that the virus might have been transferred by means of the lancet used for blood counts. Furthermore, they noted the length of the incubation period in their cases as compared with spontaneous catarrhal jaundice and posed the question whether or not there might be two viruses.

Postvaccinal jaundice was next recorded in Africa where it was observed in the course of yellow fever vaccination. Findlay and MacCallum [23] reported in 1937 and in 1938 that in the course of 4½ years they had vaccinated approximately 2,200 persons against yellow fever and observed 52 cases of jaundice occurring from 2 to 7 months after this vaccination. In their 1939 report, Findlay, MacCallum, and Murgatroyd [24] stated that there had been a total of 96 cases among 3,100 persons vaccinated, or slightly more than 3 percent. In some groups, the incidence was apparently as high as 15 percent. During this period, the actual method of vaccination underwent several changes. The basic principle consisted of the use of a mouse passage neurotropic strain of yellow fever virus grown in tissue culture in a medium containing Tyrode's solution, chick-embryo tissues, and normal monkey, or normal human, serum. Human serum had been added also as a stabilizing vehicle in the stage of desiccation (lyophilization) of the vaccine.

Findlay and MacCallum were convinced that jaundice was not caused by the yellow fever virus itself. In their 1939 report they again analyzed in detail various factors involved in this episode and came to the conclusion that the causal agent of the jaundice was a virus, that it had been cultivated serially in tissue cultures in symbiosis with yellow fever virus, and that it must have been introduced into tissue cultures in association with human serum. As further proof of the viral nature of the icterogenic agent, they stated that it must have passed filters freely, as the yellow fever virus was filtered frequently during cultivation in vitro. In an effort to eliminate this

---

22 Flaum, A., Malmros, H., and Persson, E.: Eine nosocomiale Ikterus-epidemie. Acta med. Scandinav. Suppl. 16: 544–553, 1926.

23 (1) Findlay, G. M., and MacCallum, F. O.: Note on Acute Hepatitis and Yellow Fever Immunization. Tr. Roy. Soc. Trop. Med. & Hyg. 31: 297–308, November 1937. (2) Findlay, G. M., and MacCallum, F. O.: Hepatitis and Jaundice Associated With Immunization Against Certain Virus Diseases. Proc. Roy. Soc. Med. 31: 799–806, May 1938.

24 Findlay, G. M., MacCallum, F. O., Murgatroyd, F.: Observations Bearing on the Aetiology of Infective Hepatitis (So-Called Epidemic Catarrhal Jaundice). Tr. Roy. Soc. Trop. Med. & Hyg. 32: 575–586. February 1939.

contaminating virus, they changed their method of vaccine production. When they began to use a newly received strain of yellow fever virus, the 17D strain, which was sent to them from the laboratories of the International Health Division of the Rockefeller Foundation, New York, N.Y., in November 1937, the jaundice failed to appear among approximately 8,000 persons vaccinated.

Jaundice as a result of vaccination against yellow fever began to be recorded from other geographical areas. Soper and Smith [25] described, in 1938, an outbreak which followed vaccination against yellow fever in 1936 and 1937 in Brazil. At that time, the virus used was the 17E strain grown in tissue cultures with a human serum mixture. However, this was complicated by the fact that the patients concomitantly received hyperimmune monkey serum. Apparently, more than 30 percent of those vaccinated with this material developed jaundice. No definite conclusion was reached at that time as to the jaundice, but the serum came under suspicion. In 1939, another sharp outbreak of jaundice was observed in Brazil and described by Sawyer.[26] A new strain of virus was sent from the New York laboratories to Brazil, and the manufacture of vaccine was resumed in 1940. In addition to the change of the strain of virus, the use of human serum in the preparation of the vaccine was discontinued, and in 1944 it was reported that no further cases of postvaccinal jaundice had occurred.

In the meantime, jaundice following the use of immune serum given as a prophylactic against other diseases was reported elsewhere. In 1938, Propert [27] published the observation that, following the injection of a pool of measles-immune serum in children in England, a number of cases of hepatitis occurred, some of them fatal. At the same time, MacNalty [28] published a similar report stating that two groups of individuals, numbering 82 and 109 persons, respectively, had been inoculated with the same pool of measles-immune serum, 37 of these had developed jaundice, and 7 had died.

It would seem, then, that at least in certain circles the existence of serum hepatitis had become well appreciated, although actually the general concept was not widespread, nor had it appeared in the general medical literature in the United States.

The Postvaccinal Epidemic

By 1940, the vaccination of individuals against yellow fever had become a widely used and well-recognized prophylactic measure effective in protect-

---

[25] Soper, F. L., and Smith, H. H.: Yellow Fever Vaccination With Cultivated Virus and Immune and Hyperimmune Serum. Am. J. Trop. Med. 18: 111–134, March 1938.

[26] Sawyer, W. A., Meyer, K. F., Eaton, M. D., Bauer, J. H., Putnam, P., and Schwentker, F. F.: Jaundice in Army Personnel in the Western Region of the United States and Its Relation to Vaccination Against Yellow Fever. Am. J. Hyg. 40: 35–107, July 1944.

[27] Propert, S. A.: Hepatitis After Prophylactic Serum. Brit. M.J. 2: 677–678, 24 Sept. 1938.

[28] MacNalty, A. S.: Acute Infectious Jaundice and Administration of Measles Serum. *In* Great Britain, Ministry of Health. On the State of the Public Health. Annual Report of the Chief Medical Officer of the Ministry of Health for the Year 1937. Publication No. 42. London: His Majesty's Stationery Office, 1938.

ing individuals against this disease. It had become a routine procedure in certain areas. Furthermore, the annoying occurrence of jaundice following vaccination had apparently been eliminated and this vaccinating procedure certainly must have appeared as a safe and logical one to use on troops. It was recognized as a new and valuable prophylactic measure for the preventive medical officer in global warfare. Early in 1941, with the impending outbreak of hostilities, the Preventive Medicine Service in the Office of the Surgeon General was faced with a decision as to the extent to which yellow fever immunization should be employed in U.S. troops. At that time, the war was being bitterly waged in Africa and, although Japan had not yet declared war against the Allies, the possibility of troop movements to or from Africa, India, and the East and the transfer of U.S. troops to these areas was unpredictable although certainly possible. In particular, attention was called to the possibility of introducing yellow fever from Africa into India, a danger which had long been under discussion and which, had it materialized, would have been an epidemic calamity of the first order.

In the summer of 1940, an epidemic of yellow fever occurred in the Nuba Mountains of the Anglo-Egyptian Sudan.[29] There were 15,000 cases and more than 1,500 deaths reported in this epidemic. The proximity of this outbreak to the African war zones, together with the risks to the local civilian populations, had created a great demand for vaccine to be used in this area. Furthermore, the questions had arisen whether or not British troops might have to withdraw from North Africa and Egypt to the Sudan and whether or not U.S. troops might have to be placed in large numbers in this area or other potential epidemic areas, thus giving rise to strong indications for vaccination against yellow fever.

As it is the purpose of this chapter to discuss technical and scientific aspects of the vaccination of U.S. troops against yellow fever and the relation of the vaccine administered late in 1941 and early in 1942 to the subsequent large outbreak of jaundice, matters of determination of policy and the reasons therefor will not be included. For these important details, the reader is referred to volume III of this series.[30] Additional details are to be found in the articles by Sawyer.[31]

The policy of vaccinating on a large scale was adopted in 1940 on the recommendation of the Subcommittee on Tropical Diseases of the National Research Council and was put into effect in 1941. This caused unprecedented demands on the supply of yellow fever vaccine. To meet these demands, the manufacture of yellow fever vaccine on a large scale for military use was organized late in 1940 by the International Health Division of the Rockefeller

---

[29] Kirk, R.: Epidemic of Yellow Fever in the Nuba Mountains, Anglo-Egyptian Sudan. Ann. Trop. Med. 35: 67–112, October 1941.

[30] Medical Department, United States Army. Preventive Medicine in World War II. Volume III. Personal Health Measures and Immunization. Washington: U.S. Government Printing Office, 1955, p. 306, Vaccination Against Yellow Fever and footnotes thereto.

[31] See footnote 26, p. 422.

Foundation. During the period from 1940 to 1942, approximately 11 million doses of this vaccine were supplied by this agency.

A number of changes in the technique of the manufacture of the vaccine were introduced in the course of the large-scale production between 1940 and 1942, and these have been carefully reviewed by Sawyer. The history of the seed virus used is complicated and will not be reviewed here, but the addition of human normal serum was a crucial point in the procedure. During the 4 years of in vitro cultivation before final adoption for human immunization, the 17D strain of yellow fever virus originally derived from the unmodified Asibi strain was used. It was grown in a medium of chick-embryo tissue and Tyrode's solution containing 10 percent normal monkey or human serums. The reason for including human serum in the vaccine was to insure its efficacy as an immunizing agent. The virus of yellow fever is said to be one of the most labile viruses, and the addition of serum to it delays its inactivation process greatly. For large-scale manufacture of the yellow fever vaccine, therefore, large quantities of human serum were needed for the tissue cultures. This was usually obtained from professional blood donors, but in 1941 it became necessary to arrange for additional sources of serum, which was required at the rate of 8 or 10 liters per week. This additional source of serum was obtained through the School of Hygiene and Public Health, Johns Hopkins University, Baltimore, Md., where it was secured from volunteers in that city. The donors consisted largely of medical students, interns, nurses, and laboratory technicians, all presumably healthy. In retrospect, it would seem that it was this "innocent" lot of serum which gave rise to contamination of the vaccine with an icterogenic agent, an accident which could hardly have been predicted at that time.[32]

It is important to point out that the serum was inactivated by heat. On receipt of the serum from Baltimore, a sterility test was first made on the contents of each bottle, and it was then immersed in a covered serologic water bath and held at a temperature between 56° and 57° C. for 1 hour. The actual temperature of the serum during inactivation was not measured, but it is known that there is a certain timelag before the temperature of the serum in the flasks and that of the surrounding water reach an equilibrium. It was estimated that this lag may have varied from 10 to 30 minutes, but it is reasonable to believe that all serums were inactivated at a temperature of 56° C. in 30 minutes. This is important, for no doubt it gave the manufacturers of the vaccine confidence that all viable contaminating agents had been killed, whereas there now is abundant evidence that this temperature is insufficient to kill the virus of either infectious hepatitis or serum hepatitis.

The widespread military use of this vaccine was begun in the late fall of 1941. As already stated, an unusual number of cases of jaundice began

[32] Whether or not the hepatitis virus, originally introduced into the tissue culture by means of the serum, actually grew in the eggs will not be discussed here.—J. R. P. and H. T. G.

to appear in troops during February 1942. It was apparent by the first week in March 1942 that a disease characterized by jaundice was epidemic in the Army. From stations all over the country, reports came of the unusual incidence. Although the disease resembled so-called epidemic catarrhal jaundice, there was a suspicion that it might have some relationship to the administration of yellow fever vaccine, and after some investigation this deepened into a strong conviction. The evidence leading to this conviction was derived from outbreaks of jaundice which occurred in military units, organizations, posts, and camps in this country as well as outside the continental United States. From these observations, it appeared that invariably the soldiers who developed hepatitis in widely scattered areas and under different environmental conditions had been vaccinated with certain lots of yellow fever vaccine.

The Preventive Medicine Service made extensive use of personnel of the Board for the Investigation and Control of Influenza and Other Epidemic Diseases (Army Epidemiological Board) and its commissions. A number of the members of this Board or of its commissions had become convinced early in April 1942 that the cases resulted from the administration of yellow fever vaccine.

Actually, this decision had been reached independently in a number of areas. In a note from Stockton Field, Calif., on 20 March 1942, Dr. Karl F. Meyer of the George Williams Hooper Foundation stated that he believed the cases of jaundice had resulted from the administration of yellow fever vaccine. On 10 April 1942, Dr. Meyer stated to the senior author upon his arrival in San Francisco, Calif., that it seemed practically assured that the vaccine contained an icterogenic agent which was responsible for the outbreak. Dr. Kenneth F. Maxcy, who was investigating cases at Jefferson Barracks, Mo., at about this same time, and a number of other investigators, arrived at a similar conclusion.

As a result, the use, by the Army and other agencies, of all yellow fever vaccine manufactured by the International Health Division of the Rockefeller Foundation was discontinued. The chief lot numbers finally incriminated as being icterogenic were 331, 334, 335, 338, 367, 368, and 369. A vaccine prepared by the U.S. Public Health Service in its Rocky Mountain Laboratory, Hamilton, Mont., was substituted. Subsequently, the vaccine was prepared without the human serum component. After this action, cases of jaundice following inoculation with yellow fever ceased to occur.

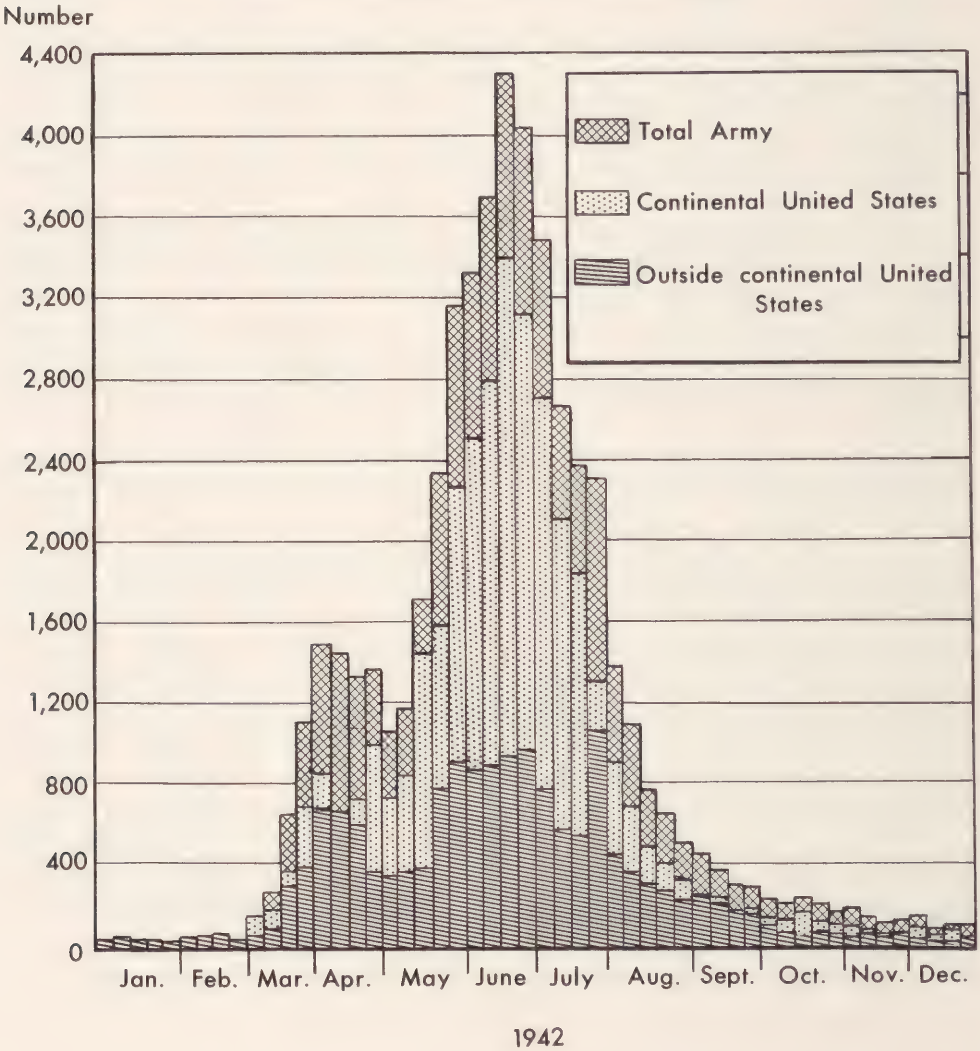
Thus, the evidence incriminating the vaccine was accumulated by the various teams in the field. The indictment of the vaccine, particularly by Dr. Maxcy after his investigation at Jefferson Barracks, made the investigation perhaps one of the most dramatic and effective epidemiological investigations carried out during the war.

559625v—61——29

Extent of postvaccinal epidemic

The total number of infectious hepatitis cases reported during 1942 is provisionally set at 49,233 for the total U.S. Army (chart 3). Of these, 33,569 were reported from the continental United States, and 15,664 from oversea theaters. Although the vast majority of these cases were probably due to the vaccineborne infection, it is impossible actually to determine how many were postvaccinal. However, the type of epidemic curve in 1942 certainly suggests that the great majority of these cases followed the use of the yellow fever vaccine. The rapid subsidence of the epidemic followed discon-

CHART 3.—*Reported weekly admissions for jaundice (essentially serum hepatitis) in the total U.S. Army, 1 January to 31 December 1942*



tinuation of the vaccine which occurred after the peak of the epidemic had been reached in June 1942. The time relationship is perfectly in keeping with the incubation period of serum hepatitis.

Table 45 contains data concerning admissions for and deaths due to infectious hepatitis and serum hepatitis in 1942 in the various areas. The size of this epidemic of serum hepatitis can be visualized also from a glance at chart 3, which shows the reported admissions of jaundice in troops in the total U.S. Army during 1942. The shape of the epidemic curve and the fact that it occurred out of season are obviously related to the manner in which the Army's vaccination program against yellow fever was carried out.

TABLE 45.—*Admissions for and deaths due to infectious hepatitis and serum hepatitis in the U.S. Army, by theater or area, 1942* [1]

[Admission rate expressed as number of admissions per annum per 1,000 average strength; death rate expressed as number of deaths per annum per 100,000 average strength]

Theater or area	Admissions		Deaths	
	Number	Rate	Number	Rate
Continental United States	33, 569	12. 63	63	2. 37
Overseas:				
North America [2]	4, 380	43. 53	11	10. 93
Latin America	863	8. 47	2	1. 96
Europe	1, 950	23. 49	2	2. 41
Pacific Ocean Area	6, 306	41. 77	5	3. 31
Southwest Pacific	1, 888	26. 51	1	1. 40
Other areas	277	7. 34		0
Total overseas	15, 664	26. 74	21	3. 59
Total Army	49, 233	15. 18	84	2. 59

[1] The admission data are partially estimated and are based on tabulations of individual medical records and the statistical health report. Mortality data are based on complete tabulations of individual medical records, but they probably represent the minimum number of deaths due to infectious hepatitis and serum hepatitis. Some of the deaths ascribed to acute yellow atrophy of the liver or related conditions were probably caused by viral hepatitis. All data are preliminary.

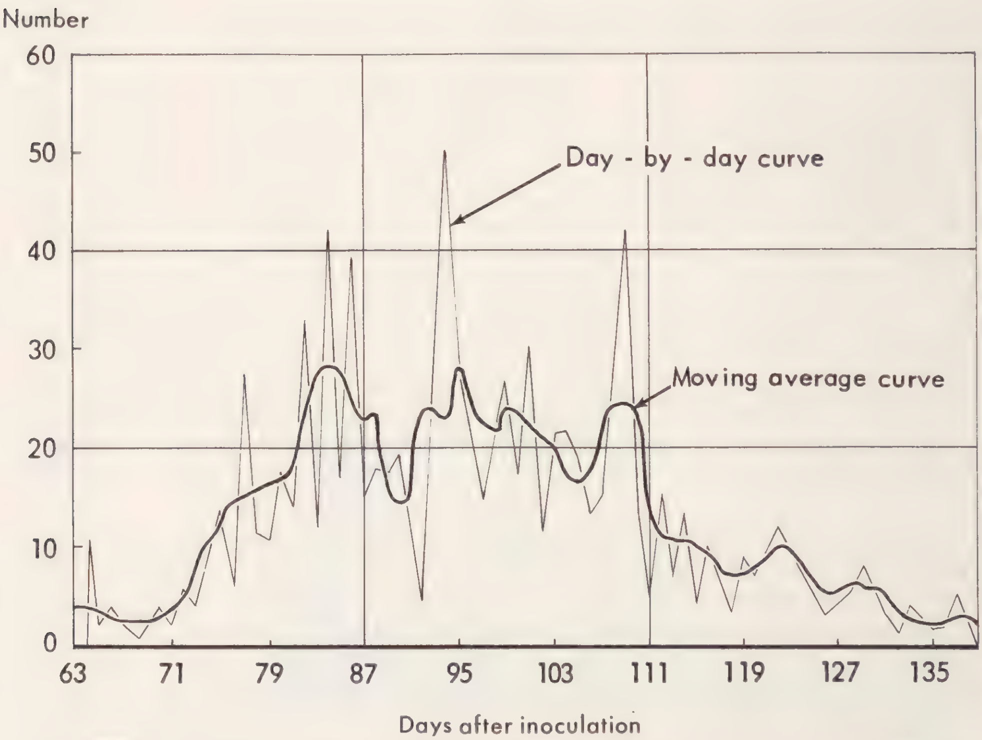
[2] Includes Alaska.

During the latter part of 1941, all air corps personnel and the ground troops who were alerted for oversea duty were the first units to be inoculated with the yellow fever vaccine. It was subsequently found that the vaccine administered at this time included three highly icterogenic lots. Between 20 January and 15 April 1942, all other personnel in the Army were vaccinated. For the overall period, six highly icterogenic lots were found. Since the incubation period for serum hepatitis ranges from 60 to 154 days, it becomes apparent that the first peak in chart 3 resulted from the use of the icterogenic lots of vaccine in late 1941. Similarly, the later administration of addi-

tional icterogenic lots to a much greater number of troops gave rise to a second and higher peak.

Another feature which should be appreciated is that the long incubation period of serum hepatitis is exceedingly variable. Even when the icterogenic virus has been administered to all members of a given unit at one time, the onset of the resulting cases may be spread over many weeks or months, resulting in the picture of a continuing epidemic. Thus, the day-by-day epidemic curve for Camp Polk, La., which was studied by Parr,[33] appears to be that of a long epidemic, yet it was precipitated by a single, uniform exposure, for all of these men were inoculated on the same day with the same lot and dose of vaccine. The statistics showed that at Camp Polk on 27 February 1942 more than 5,000 soldiers were inoculated with lot number 369 of yellow fever vaccine and that they remained at this camp for the next several months. Among these soldiers, 1,004 cases of jaundice appeared. The range of the incubation period of these 1,004 cases was from 60 to 154 days; the mean incubation period was 96.41 days. Chart 4 well illustrates

CHART 4.—*Variation in incubation period of 1,004 cases of serum jaundice following uniform single inoculation with yellow fever vaccine at Camp Polk, La., on 27 February 1942*



[33] Parr, L. W.: Host Variation in the Manifestation of Disease: With Particular Reference to Homologous Serum Jaundice in the Army of the United States. M. Ann. District of Columbia 14: 443–449, October 1945.

the manner in which an epidemic precipitated by a common source of infection may be influenced by host variation as expressed by an incubation period of varying duration. It is a demonstration by Parr of one of the features in which this disastrous epidemic may be said to have contributed to the science of epidemiology.

Other indications of the icterogenic nature of the vaccine were the different experiences of the Army and Navy. The Navy, using different lots of vaccine, reported practically no jaundice during 1942. The Navy did not receive icterogenic lots of vaccine, except numbers 334 and 369, and used these lots to a limited extent.

Of further epidemiological importance was the fact that this disease did not spread within the camps to nonvaccinated individuals. If it had, the situation would have been hopelessly confused. This is in keeping with later experimental work which has indicated that the patient with serum hepatitis is not very infectious unless blood is taken from him during the stage of viremia and inoculated into another person. Some evidence for cross infection has been reported by Freeman [34] in that four wives of soldiers who had received yellow fever vaccine (three of whom had developed postvaccinal jaundice) acquired hepatitis with jaundice. This must have been a relatively uncommon occurrence. The fact that it may occasionally occur as the result of intimate contact is, however, a point of considerable importance. Freeman believed that the spatial and temporal grouping of cases in the epidemics of serum hepatitis at Fort Belvoir, Va., Fort Sill, Okla., and Fort Lewis, Wash., among troops who had received yellow fever vaccine at approximately the same time, together with an increase in the attack rate in unvaccinated troops in the same period in these forts, indicated a communicable disease rather than one directly due to inoculation of the agent in the vaccine. He advanced the theory that the vaccine predisposed the affected individuals to a naturally occurring infectious hepatitis. The authors believe this to be highly unlikely. An overwhelming preponderance of evidence pointed to the vaccine as the causative agent, although some Army medical officers and some civilian physicians steadfastly opposed this view, and of these a small minority apparently still do to this day.

Clinical aspects

In such a large number of cases of hepatitis, there was no dearth of clinical material. Several clinical studies of large series of cases were made. The best of the early descriptions was that by Turner and coworkers.[35] They described their experiences with this disease at Camp Polk, where the

---

[34] Freeman, G.: Epidemiology and Incubation Period of Jaundice Following Yellow Fever Vaccination. Am. J. Trop. Med. 26: 15–32, January 1946.

[35] Turner, R. H., Snavely, J. R., Grossman, E. B., Buchanan, R. N., and Foster, S. O.: Some Clinical Studies of Acute Hepatitis Occurring in Soldiers After Inoculation With Yellow Fever Vaccine, With Especial Consideration of Severe Attacks. Ann. Int. Med. 20: 193–218, February 1944.

number of hepatitis patients reported during the period from 1 May to 12 September 1942 was 4,083 with 14 deaths—a very large series of cases, indeed.

It is not the function of this review to dwell on the clinical picture of serum hepatitis or its therapy in this epidemic, except as it pertains to the etiology and epidemiology of the viral hepatitides. By and large, Turner and coworkers believed the acute hepatitis in these epidemics was indistinguishable clinically from infectious hepatitis or catarrhal jaundice. They did, however, note special features, which subsequent authors have also stressed. For example, the disease at Camp Polk nearly always began insidiously without a preliminary bout of fever. This is in some contrast to the clinical picture of infectious hepatitis where the onset of the disease is more apt to be abrupt and accompanied by initial fever in a large percentage of cases.

In the fatal cases of serum hepatitis, death usually occurred from 2 to 6 weeks after the onset of illness. Autopsy findings ranged from that of acute yellow atrophy to that of a very irregular liver with islands or "lobules" of regenerated liver cells. Prominent changes in organs other than the liver included edema of the gastrointestinal tract. Extensive descriptions of the pathology of the liver in fatal cases in this outbreak may be found in the paper by Col. Balduin Lucké.[36]

In retrospect, it would seem that the experience with this epidemic was not altogether unfortunate. It was drastic enough at the time to leave a deep impression in the minds of Army medical officers. Difficulties with serum jaundice were to continue for the rest of the war and indeed to the present time, but few events could have driven home the lesson so forcibly as did this 1942 epidemic. From this experience, it gradually became apparent to the medical profession that jaundice following transfusions and the administration of pooled plasma or, in fact, the use of any serum presents a considerable problem and that serum or syringe hepatitis is an avoidable complication which has demanded increasing attention since it was first recognized.

The fact that there are a variety of methods of artificially inducing hepatitis besides transfusion or serum injection has been slowly and painfully impressed upon the medical profession. For example, it became apparent that cases of serum hepatitis actually could follow the use of improperly sterilized needles and syringes used for giving injections. This was experienced in various types of clinics including diabetes and arthritis clinics, as well as in performing blood counts. It was realized that so-called arsphenamine jaundice actually represented examples of syringe hepatitis transmitted in the course of intravenous therapy. In certain clinics where the rate of postarsphenamine jaundice had been very high, the introduction of improved sterilization techniques caused the incidence of syringe jaundice

[36] Lucké, B.: I. The Pathology of Fatal Epidemic Hepatitis. II. The Structure of the Liver After Recovery From Epidemic Hepatitis. Am. J. Path. 20: 471–593, 595–619, May 1944.

to undergo a spectacular decline. The whole question of jaundice following intravenous therapy for syphilis was reviewed by British physicians, both military and civilian, particularly during 1943 and 1944.

Thus, the concept that the syringe could serve as a possible vector of disease has developed. In future military preventive medicine, the contaminated syringe may receive as serious consideration as a vector of disease as mosquitoes or flies.

IMPORTANCE AS A MILITARY PROBLEM

The importance of infectious hepatitis as a military problem in World War II is nowhere better illustrated than in the overall rates for the total Army, both within the Zone of Interior and in oversea areas. During the entire war experience, the total number of cases was about 200,000. Since the average period of hospitalization or illness per case was from 25 to 50 days, a huge amount of time was lost from active duty as a result of this illness. Furthermore, this time loss occurred at critical periods and in critical areas of combat. Table 46 well illustrates the great importance of infectious hepatitis as a military problem.

TABLE 46.—*Admissions for infectious and serum hepatitis in the U.S. Army, by broad geographic area and by year, 1942–45*

[Rate expressed as number of admissions per annum per 1,000 average strength]

Area	1942-45		1942		1943		1944		1945	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Continental United States	46, 750	3. 17	33, 569	12. 63	3, 906	0. 75	3, 175	0. 80	6, 100	2. 08
Overseas	135, 633	12. 63	15, 664	26. 74	24, 966	14. 79	24, 608	6. 44	70, 395	15. 16
Total Army	182, 383	7. 16	49, 233	15. 18	28, 872	4. 20	27, 783	3. 57	76, 495	10. 10

The total number of admissions reported for hepatitis (both infectious and serum) from 1942 to 1945 was 182,383 for U.S. troops. The total number of deaths due to infectious hepatitis was recorded as 352. This number probably represents the minimum number of deaths caused by infectious and serum hepatitis. Some of the deaths ascribed to acute yellow atrophy of the liver or related conditions were probably caused by viral hepatitis. It will be noted that the high morbidity rate in 1942 in the total Army is accompanied by a high rate in the United States as well as in oversea areas. Obviously, this was due to the great outbreak of serum hepatitis which affected the rates both in the United States and abroad.

Between 1939 and 1945, infectious hepatitis in the Zone of Interior was presumably not a great problem, and the incidence did not differ greatly from the estimated incidence in the Army before 1939. It should be noted

however, that the incidence of infectious hepatitis increased in the spring of 1945 and continued high through 1946. Almost half of the cases that year were reported by ports of debarkation, staging areas, and general hospitals. It may be presumed, therefore, that the increased incidence of hepatitis was not due to infection acquired in this country but to troops who had been ill with hepatitis at the time they had been evacuated from oversea areas or to soldiers who had been infected overseas and who became ill on returning to the United States. The distribution of troops returned from overseas, however, was so diverse that this cannot definitely be ascertained. While the rates were increasing in the United States there was also a considerable increase reported from oversea theaters, particularly from the Southwest Pacific, during 1945.

The reason for this rise is not clear. The redeployment of troops in Europe preparatory to their return either to the United States or to the Pacific to take part in the anticipated assault on Japan may have contributed, at least in the European theater, to the increasing rate. Redeployment resulted in the mingling of troops from throughout the European theater in the famous Lucky Strike, Chesterfield, and other staging areas with recruit replacements who, in general, represented groups of susceptible immigrants entering an infected population. This, together with the inevitable breakdown of personal sanitation and the increased opportunity for mingling with the civilian populations in Italy, France, and Germany after combat, may have contributed to the rise in incidence. It is difficult, however, to assess the relative importance of individual factors. There was a parallel and striking increase in venereal disease at this time and in these areas, which certainly indicated more frequent and prolonged contact between soldiers and civilians in Europe.

RESEARCH BY ARMY EPIDEMIOLOGICAL BOARD COMMISSIONS

Organization of Hepatitis Study Group.—The Medical Department of the U.S. Army, and particularly the Preventive Medicine Service of the Office of the Surgeon General, should take considerable pride in the part that the U.S. Army played in the collection of useful information about viral hepatitis, not only as a military problem but also as a civilian problem. The investigations of three commissions of the Army Epidemiological Board were a cooperative venture which demonstrated how a group of widely separated laboratories could pool their information and work together. To facilitate this cooperative undertaking in July 1944, the Board created a special hepatitis committee, an ad hoc committee known as the Hepatitis Study Group.[37] The organization was not so closely knit, however, that

[37] The "Hepatitis Study Group" of the Army Epidemiological Board was never officially organized although it held a number of meetings. Among those who attended were Dr. T. Francis, Jr.; Capt. Sidney S. Gellis, MC; Maj. W. Paul Havens, Jr.; Dr. Charles A. Janeway; Capt. John R. Neefe, MC; Dr. Joseph Stokes, Jr.; Lt. Col. (later Col.) Roy H. Turner, MC; and Dr. John R. Paul, Chairman.

individual laboratories and members thereof did not retain a sense of independence and individual achievement.

The experimental work of this group was actually carried out primarily by the following three commissions: The Commission on Measles and Mumps, with headquarters in Philadelphia, Pa.; the Neurotropic Virus Disease Commission, in New Haven, Conn.; and the Influenza Commission, in Ann Arbor, Mich. The respective field and laboratory work was carried out by and under the direction of (1) Dr. Joseph Stokes, Jr., and Capt. John R. Neefe, MC, at the Children's Hospital of Philadelphia and the School of Medicine, University of Pennsylvania, (2) Dr. John R. Paul and Maj. W. Paul Havens, Jr., MC, of the Section of Preventive Medicine, School of Medicine, Yale University, New Haven, Conn., and (3) Dr. Thomas Francis, Jr., at the School of Public Health, University of Michigan, Ann Arbor, Mich.

Scope and objective.—Just when it became generally accepted that this group of diseases was viral in nature is not clear, nor has this supposition been established beyond doubt today. It was clear by 1938, however, that the agent was filterable. This discovery stemmed from the prewar work of MacCallum and Findlay in England. That the agent possessed certain other properties common to viruses was established later.

The main objective of all three research groups of the Army Epidemiological Board was essentially that of determining the manner by which hepatitis was spread so that methods of controlling the disease might be devised. One of the first contributions made by their researches was the establishment of a hypothesis of the existence of two disease entities—infectious hepatitis and serum hepatitis. In some ways this distinction would seem to be of academic interest only, but actually it had important repercussions in the field of military preventive medicine. However similar the two diseases may be clinically, our present concept of the prevention of infectious hepatitis is based on the provision of good environmental sanitation, whereas that of the control of serum hepatitis is based on the proper control of blood for transfusions and the adequate sterilization of instruments and needles. Although our present knowledge of the viral hepatitides is still clouded by many obscurities, it has increased immeasurably since the beginning of the war as a result of the research stimulated by the Army's experience with hepatitis during World War II.

Use of Human Volunteers

Details of the experimental work which involved the use of human volunteers will not be discussed here. By 1943, it was apparent that the use of experimental animals for the isolation and demonstration of hepatitis virus was not possible by means of techniques known at the time. Man appeared to be the only available experimental subject. This presented great disadvantages, but also some advantages because the study of both the clinical and experimental aspects of a disease in human beings is of real value. For

559625°—61——30

example, one is afforded the opportunity of observing patients for a period of days or weeks before the onset of their illness. The use of volunteers for the study of hepatitis and other diseases became part of the wartime program of the Army Epidemiological Board. Such work was made possible by the Board through provision of opportunities and facilities for these expensive experiments. The contribution made by these volunteers to the welfare of humankind was great, and no discussion of their participation in medical research should fail to take cognizance of their courage and generosity.

A number of different units of volunteers cooperated with the Commission on Measles and Mumps. These units included inmates of the New Jersey State Prison at Trenton, N.J., and groups of conscientious objectors from a special organization for this purpose known as CPS (Civilian Public Service) Unit No. 140 of Philadelphia, Pa. The Commission at Yale University obtained volunteers from various groups of conscientious objectors at work in State institutions in the vicinity of New Haven, including CPS Unit No. 81, organized at the Connecticut State Hospital, Middletown, Conn.; CPS Unit No. 68 organized at the Norwich State Hospital, Norwich, Conn.; and, later, a special branch of CPS Unit No. 140, organized and maintained in one of the fraternity houses at Yale University. In addition, a number of volunteers were found among prisoners at the Federal Correctional Institution, Danbury, Conn., and at the State Prison, Wethersfield, Conn. The University of Michigan group utilized volunteers from the State Prison of Southern Michigan, Jackson, Mich. The relationship of the exploratory work on hepatitis involving the use of volunteers to the development of knowledge of serum hepatitis and infectious hepatitis is illustrated by the results of all the significant transmission experiments shown in table 47 which is a modification of data appearing in Havens' monograph.[38] Although the occurrence of nonicteric hepatitis is recognized, only jaundiced cases, in which the diagnosis could be definite, are recorded in this table, with the exception of figures in parentheses in the "jaundiced" column. In this and subsequent tables, authors of reports on work done under the auspices of the Army Epidemiological Board appear in italics.

Infectious Hepatitis

It will be recalled that a primary objective of wartime research on the hepatitides was the determination of their mode or modes of transmission. Many contributions to the knowledge of infectious hepatitis resulted from these researches.

Voegt (p. 417), in Germany, first reported the transmission of hepatitis to volunteers by feeding to them duodenal fluid and blood obtained from

[38] Havens W. P., Jr.: Infectious Hepatitis. Medicine 27: 279–326, September 1948.

patients in the acute phase of the disease. Published accounts of his experiments are quite inadequate. In 1944, MacCallum and Bradley [39] of the Jaundice Committee of the British Medical Research Council reported some highly significant experimental results. The report described recent success in transmitting viral hepatitis to arthritic patients who had volunteered for this procedure. Various routes of transmission were used, and infective material included feces given per os. Independently, members of the Neurotropic Virus Disease Commission were also successful during the same summer in producing the disease in volunteers at CPS Units Nos. 68 and 81, who had been fed fecal specimens obtained from soldiers in the Mediterranean area during the epidemic of 1943. A report of this work was first presented at the first meeting of the Hepatitis Study Group, held at the Rockefeller Institute for Medical Research in New York on 12 July 1944 and published in November 1944.[40]

TABLE 47.—*Results of administration, to volunteers, of materials obtained from patients in the acute phase of infectious hepatitis*

[In the "Route" column, O=oral; NP=nasopharyngeal; P=parenteral]

Inoculum	Authors	Year	Route	Volunteers		Incubation period
				Inoculated	Jaundiced	
				Number	*Number*	*Days*
Feces	Voegt (duod. fl.) [1]	1942	O	4	(1)	28
	MacCallum & Bradley.[2]	1944	NP	26	3	27–31
	Havens [3]	1944–46	O	12	9	15–27
	Neefe et al [4]	1944–46	O	46	25	18–27
	Neefe et al [4]	1944–46	P	3	0	--------
	Findlay & Willcox.[5]	1945	O	18	(7)	17–28
Serum	Voegt (blood) [1]	1942	O	(?)	1	(?)
	Voegt (blood) [1]	1942	P	(?)	1	19?
	MacCallum & Bradley.[2]	1944	P	6	3	64–92
	Havens [3]	1944–46	P	17	8	20–31
	Havens [3]	1944–46	O	8	7	21–34
	Oliphant [6]	1944	P	21	4	85–106
	Francis et al [7]	1945	P	8	4	35–43
	Neefe et al [4]	1945	P	6	1	35
	Neefe et al [4]	1946	O	3	2	26 & 33

See footnotes at end of table.

[39] MacCallum, F. O., and Bradley, W. H.: Transmission of Infective Hepatitis to Human Volunteers. Lancet 2: 228, August 1944.

[40] Havens, W. P., Jr., Ward, R., Drill, V. A., and Paul, J. R.: Experimental Production of Hepatitis by Feeding Icterogenic Materials. Proc. Soc. Exper. Biol. & Med. 57: 206–208, November 1944.

TABLE 47.—*Results of administration, to volunteers, of materials obtained from patients in the acute phase of infectious hepatitis*—Continued

Inoculum	Authors	Year	Route	Volunteers		Incubation period
				Inoculated	Jaundiced	
				Number	*Number*	*Days*
Nasopharyngeal washings.	MacCallum & Bradley.[2]	1944	NP	16	0	--------
	Neefe et al [4]	1945	NP	8	0	--------
	Havens [8]	1946	NP	3	0	--------
Urine	Voegt [1]	1942	O	(?)	(1)	(?)
	MacCallum & Bradley.[2]	1944	NP & O	19	0	--------
	Findlay & Willcox.[5 9]	1945	O	6	(3)	(?)
	Neefe & Stokes [10]	1945	O	7	0	--------
	Havens [8]	1946	O	3	0	--------

[1] Voegt, H.: Zur Aetiologie der Hepatitis Epidemica. Munchen. med. Wchnschr. 89: 76, 23 Jan. 1942.

[2] MacCallum, F. O., and Bradley, W. H.: Transmission of Infective Hepatitis to Human Volunteers. Lancet 2: 228, August 1944.

[3] (1) Havens, W. P., Jr., Ward, R., Drill, V. A., and Paul, J. R.: Experimental Production of Hepatitis by Feeding Icterogenic Materials. Proc. Soc. Exper. Biol. & Med. 57: 206–208, November 1944. (2) Havens, W. P., Jr.: Properties of the Etiologic Agent of Infectious Hepatitis. Proc. Soc. Exper. Biol. & Med. 58: 203–204, March 1945. (3) Havens, W. P., Jr.: The Period of Infectivity of Patients With Experimentally Induced Infectious Hepatitis. J. Exper. Med. 83: 251–258, March 1946. (4) Havens, W. P., Jr.: Immunity in Experimentally Induced Infectious Hepatitis. J. Exper. Med. 84: 403–406, November 1946. (5) Havens, W. P., Jr.: Experiment in Cross Immunity Between Infectious Hepatitis and Homologous Serum Jaundice. Proc. Soc. Exper. Biol. & Med. 59: 148–150, June 1945. (6) Havens, W. P., Jr.: Elimination in Human Feces of Infectious Hepatitis Virus Parenterally Introduced. Proc. Soc. Exper. Biol. & Med. 61: 210–212, March 1946.

[4] Neefe, J. R., Gellis, S. S., and Stokes, J., Jr.: Homologous Serum Hepatitis and Infectious (Epidemic) Hepatitis: Studies in Volunteers Bearing on Immunological and Other Characteristics of the Etiological Agents. Am. J. Med. 1: 3–22, July 1946.

[5] Findlay, G. M., and Willcox, R. R.: Transmission of Infective Hepatitis by Feces and Urine. Lancet 1: 212, 17 Feb. 1945.

[6] Oliphant, J. W.: Infectious Hepatitis: Experimental Study of Immunity. Pub. Health Rep. 59: 1614–1616, 15 Dec. 1944.

[7] Francis, T., Jr., Frisch, A. W., and Quilligan, J. J., Jr.: Demonstration of Infectious Hepatitis Virus in Presymptomatic Period After Transfer by Transfusion. Proc. Soc. Exper. Biol. & Med. 61: 276–280, March 1946.

[8] Havens, W. P., Jr.: The Period of Infectivity of Patients With Homologous Serum Jaundice and Routes of Infection in This Disease. J. Exper. Med. 83: 441–447, June 1946.

[9] In a subsequent publication (Infective Hepatitis in West Africa; Syringe-Transmitted Hepatitis. Month. Bull. Min. Health & Emerg. Pub. Health Lab. Serv. 7: 32–39, February 1948), Findlay has suggested that the apparent infectivity of urine in his experiment was due to the presence of erythrocytes associated with urinary bilharziasis.

[10] Neefe, J. R., and Stokes, J., Jr.: An Epidemic of Infectious Hepatitis Apparently Due to a Water Borne Agent. J.A.M.A. 128: 1063–1075, 11 Aug. 1945.

Subsequently, it was demonstrated by various groups that the etiological agent of infectious hepatitis was filterable through an L2 Chamberland or Seitz E.K. filter, that it resisted heating at 56° C. for at least 30 minutes, and that it was transmissible to man in serial passage by feeding or parenteral inoculation of infectious material from feces and blood. The virus was shown to withstand chlorination, namely, one part chlorine residual per million for 30 minutes, and to remain active in materials frozen for 1 or 1½ years, but not for 3 years, at −10° to −20° C. The negative results of trans-

mission experiments utilizing urine and nasopharyngeal washings were equally important. Urine and naso-urine and nasopharyngeal washings, as possible conveyers of the virus, have not been completely investigated, and contradictory results have been reported by various groups which have administered urine by mouth to volunteers. In general, however, results indicate that the virus cannot be found in these fluids, or, at least, cannot be found very easily.

A limited number of experiments were conducted to investigate the period of infectivity of patients with infectious hepatitis in relation to the clinical disease (table 48). The results are not clear cut. It is apparently during the period of active disease (acute illness), and not during the greater part of the incubation period or during convalescence, that the virus may be most readily found in the blood or feces. Thus, these experiments indicated that the greatest danger of spread of the disease probably arises from the mildly ill patients who are not jaundiced and who, in the absence of overt evidence of disease, probably circulate in the community in the role of unrecognized carriers. In civilian life, such carriers may be young children in whom the disease is apt to be mild.

TABLE 48.—*Results of administration, to volunteers, of materials obtained from patients in various stages of the incubation period and convalescence of infectious hepatitis*

[F=feces; S=serum; the minus sign=before onset; the plus sign=after onset]

Authors	Year	Inoculum	Day material was obtained	Volunteers	
				Inoculated	Jaundiced
				Number	*Number*
Havens [1]	1946	F	−15	3	0
Francis et al [2]	1945	S	−3	8	4
Havens [1]	1946	F & S	25+ to 31+	10	0
Neefe et al [3]	1945	F	21 post jaundice	7	0
Neefe et al [4]	1947	Liver	180+	5	0
Neefe et al [4]	1947	S	106+ to 367+	5	0
Neefe et al [4]	1947	F	92+ to 342+	5	0

[1] Havens, W. P., Jr.: The Period of Infectivity of Patients With Experimentally Induced Infectious Hepatitis. J. Exper. Med. 83: 251–258, March 1946.

[2] Francis, T., Jr., Frisch, A. W., and Quilligan, J. J., Jr.: Demonstration of Infectious Hepatitis Virus in Presymptomatic Period After Transfer by Transfusion. Proc. Soc. Exper. Biol. & Med. 61: 276–280, March 1946.

[3] Neefe, J. R., Stokes, J., Jr., and Reinhold, J. G.: Oral Administration to Volunteers of Feces From Patients With Homologous Serum Hepatitis and Infectious (Epidemic) Hepatitis. Am. J.M. Sc. 210: 29–32, July 1945.

[4] Neefe, J. R., Stokes, J., Jr., Garber, R. S., and Gellis, S. S.: Studies on the Relationship of the Hepatitis Virus to Persistent Symptoms, Disability, and Hepatic Disturbance ("Chronic Hepatitis Syndrome") Following Acute Infectious Hepatitis. J. Clin. Invest. 26: 329–338, March 1947.

The extent to which patients convalescent from hepatitis may be carriers of the virus in either blood or feces has really not yet been determined. The number of experiments related to this problem is still too small to say whether or not 10 percent, 5 percent, or 1 percent of such convalescents might become chronic carriers.

A very important aspect of the Commission's experimental work was the demonstration by Neefe and Stokes (p. 417) of hepatitis virus (infectious hepatitis) in well water. Volunteers contracted infectious hepatitis following ingestion of water from a well which was proved to have been contaminated with feces. The work of these investigators confirmed the hypothesis, previously proposed on epidemiological grounds but not proved, that the disease might be waterborne.

A third series of experiments attempted to demonstrate experimentally the existence of homologous immunity to infectious hepatitis. Neefe and coworkers and also Havens showed that volunteers convalescent for from 6 to 9 months from experimentally induced infectious hepatitis were immune when inoculated with homologous strains (table 49). In addition, Neefe and coworkers showed that the volunteers who had recovered from hepatitis, which had been experimentally induced by a strain of virus obtained from the stools of diseased children in Pennsylvania, were immune when inoculated with a strain of hepatitis virus obtained from the stools of a soldier who had contracted the disease in Sicily. This experiment indicated a certain homogeneity of strains of the virus collected from widely different sources.

TABLE 49.—*Results of attempts to demonstrate immunity in volunteers convalescent from experimentally induced infectious hepatitis in 1946*

[In the "Challenge virus" column, IH=infectious hepatitis, and HSJ=homologous serum jaundice]

Authors	Challenge virus	Convalescents			Controls		
		Inoculated	Jaundiced	Incubation period	Inoculated	Jaundiced	Incubation period
		Number	*Number*	*Days*	*Number*	*Number*	*Days*
Havens [1]	IH	9	0		12	8	21–30
Neefe et al.[2]	IH	17	0		14	6	25–37
Neefe et al.[2]	HSJ	4	2	101, 102	9	8	60–110

[1] Havens, W. P., Jr.: Immunity in Experimentally Induced Infectious Hepatitis. J. Exper. Med. 84: 403–406. November 1946.

[2] Neefe, J. R., Gellis, S. S., and Stokes, J., Jr.: Homologous Serum Hepatitis and Infectious (Epidemic) Hepatitis: Studies in Volunteers Bearing on Immunological and Other Characteristics of the Etiological Agents. Am. J. Med. 1: 3–22, July 1946.

Of considerable practical and immunologic importance was the observation by the Philadelphia group working under Dr. Stokes that normal, human gamma globulin in a dose of 0.15 cc. per pound of body weight is an effective prophylactic when administered intramuscularly within 6 days before the onset of infectious hepatitis. Such injection was tried as a control method in a military field study on the effectiveness of gamma globulin as a military prophylactic agent for infectious hepatitis during the fall and winter of 1944–45 in Italy. The field experiments were initiated under combat conditions by Dr. Stokes and Capt. S. S. Gellis. About 1,750 men were inoculated. The results again supported the hypothesis that gamma globulin was a

potent agent for the prevention of infectious hepatitis and that it could be used in military groups under certain circumstances as a control procedure.

With respect to serum hepatitis, the situation was different. It was shown that gamma globulin, at least when it was administered to patients late in the incubation period of serum hepatitis, was not so effective in preventing the disease. In more than one series of experiments, questionably favorable results followed the administration of two doses of gamma globulin given 1 month apart during the incubation period of serum hepatitis, but no protection was demonstrable when only one dose was given.

Serum Hepatitis

Equally informative results were derived from experimental work on serum hepatitis through its transmission to volunteers (table 50). Although the occurrence of nonicteric hepatitis is recognized, only jaundiced cases, in which the diagnosis could be definite, are recorded in this table. It was on the basis of these transmission experiments that it gradually became apparent to Commission investigators and others during the latter part of 1944 that there must be two types of hepatitis virus. On the basis of these experiments, one could not postulate two different phases of the virus because all attempts to transform infectious hepatitis into serum hepatitis and vice versa ended in failure.

A pioneer in this country on transmission experiments in serum hepatitis was Dr. J. W. Oliphant of the U.S. Public Health Service. In 1943, his group transmitted serum hepatitis to a large number of volunteers by the parenteral inoculation of serum obtained from patients in the acute phase of postvaccinal (yellow fever) hepatitis. These results were corroborated and extended by others (table 50). As in the case of infectious hepatitis, it was shown that the virus was filterable through both Chamberland and Seitz E.K. filters, that it was also resistant to temperatures of 56° to 60° C. for at least 30 minutes, and that it survived a temperature of 4° C. for a long period and a temperature of —10° to —20° C. for 4½ years but apparently became inactive after 5 years at the latter temperature. It also survived a desiccated state at room temperature for at least a year, in serum containing Merthiolate in concentration of 1 in 2,000, in a mixture of equal parts of phenol and ether in 0.5 percent concentrations, and in a 0.2 percent concentration of tricresol. It was inactivated in serum, however, following exposure to ultraviolet light for 1 hour at 2,650 angstrom units and after heating at 60° C. for 10 hours in human albumin.

This virus is also transmissible to volunteers in serial passage and evokes homologous immunity, but there is no experimental indication that cross immunity exists between serum hepatitis and infectious hepatitis (table 51). This finding confirms observations in the field that many servicemen who had had serum hepatitis in 1942 contracted infectious hepatitis in Italy in 1943.

TABLE 50.—*Results of administration, to volunteers, of materials obtained from patients in the acute phase of serum jaundice*

[In the "Route" column, O=oral; IG=intragastric; P=parenteral; IN=intranasal]

Inoculum	Authors	Year	Route	Volunteers		Incubation period
				Inoculated	Jaundiced	
				Number	*Number*	*Days*
Feces	*Neefe et al* [1]	1945	O & IG	19	0	--------
	Neefe et al [1]	1945	P	5	0	--------
	MacCallum [2]	1945	O	15	0	--------
	Havens [3]	1946	O	6	0	--------
Serum	Cameron [4]	1943	P	6	6	30–30+
	Oliphant et al [5]	1943	P	186	33	28–133
	Oliphant et al [5]	1943	P	10	4	120–160
	Oliphant et al [5]	1943	IN	3	0	--------
	MacCallum & Bauer.[6]	1944	P	16	6	50–127
	MacCallum & Bauer.[6]	1944	IN	10	1	[7] 82
	Havens et al [8]	1944–46	P	13	7	56–71
	Havens et al [8]	1944–46	O & IN	13	0	--------
	MacCallum [2]	1945	P	19	12	42–80
	Neefe et al [9]	1946	P	25	14	60–135
	Neefe et al [9]	1946	O	10	0	--------
Nasopharyngeal washings.	Findlay & Martin.[10]	1943	IN	4	1	50
	MacCallum [2]	1945	IN	17	0	--------
	Neefe et al [9]	1946	IN & O	4	0	--------
Urine	*Neefe et al* [9]	1946	O	1	0	--------

[1] Neefe, J. R., Stokes, J., Jr., and Reinhold, J. G.: Oral Administration to Volunteers of Feces From Patients With Homologous Serum Hepatitis and Infectious (Epidemic) Hepatitis. Am. J.M. Sc. 210: 29-32, July 1945.

[2] MacCallum, F. O.: Transmission of Arsenotherapy Jaundice by Blood; Failure With Feces and Nasopharyngeal Washings. Lancet 1: 342, 17 Mar. 1945.

[3] Havens, W. P., Jr.: The Period of Infectivity of Patients With Homologous Serum Jaundice and Routes of Infection in This Disease. J. Exper. Med. 83: 441-447, June 1946.

[4] Cameron, J. D. S.: Infective Hepatitis. Quart. J. Med. 12: 139-155, July 1943.

[5] Oliphant, J. W., Gilliam, A. G., and Larson, C. L.: Jaundice Following Administration of Human Serum. Pub. Health Rep. 58: 1233-1242, 13 Aug. 1943.

[6] MacCallum, F. O., and Bauer, D. J.: Homologous Serum Jaundice; Transmission Experiments With Human Volunteers. Lancet 1: 622-627, 13 May 1944.

[7] One subject developed a mild jaundice on the 36th day, recovered, and developed a serious attack on the 82d day.

[8] (1) Havens, W. P., Jr., Ward, R., Drill, V. A., and Paul, J. R.: Experimental Production of Hepatitis by Feeding Icterogenic Materials. Proc. Soc. Exper. Biol. & Med. 57: 206-218, November 1944. (2) Havens, W. P., Jr.: The Period of Infectivity of Patients With Homologous Serum Jaundice and Routes of Infection in This Disease. J. Exper. Med. 83: 441-447, June 1946.

[9] Neefe, J. R., Gellis, S. S., and Stokes, J., Jr.: Homologous Serum Hepatitis and Infectious (Epidemic) Hepatitis: Studies in Volunteers Bearing on Immunological and Other Characteristics of the Etiological Agents. Am. J. Med. 1: 3-22, July 1946.

[10] Findlay, G. M., and Martin, N. H.: Jaundice Following Yellow-Fever Immunization; Transmission by Intranasal Instillation. Lancet 1: 678-680, 29 May 1943.

TABLE 51.—*Results of attempts to demonstrate immunity and cross-immunity in volunteers convalescent from experimentally induced serum jaundice*

[In the "Challenge virus" column, IH=infectious hepatitis and HSJ=homologous serum jaundice]

Authors	Year	Challenge virus	Convalescents			Controls		
			Inoculated	Jaundiced	Incubation period	Inoculated	Jaundiced	Incubation period
			Number	*Number*	*Days*	*Number*	*Number*	*Days*
Oliphant [1]	1944	IH	10	0	--------	11	4	85–106
Havens [2]	1945	IH	3	3	20–25	11	5	23–31
Neefe et al [3]	1946	IH	5	4	28–37	6	5	28–32
Neefe et al [3]	1946	HSJ	9	0	--------	9	8	60–110

[1] Oliphant, J. W.: Infectious Hepatitis: Experimental Study of Immunity. Pub. Health Rep. 59: 1614–1616, 15 Dec. 1944.

[2] Havens, W. P., Jr.: Experiment in Cross Immunity Between Infectious Hepatitis and Homologous Serum Jaundice. Proc. Soc. Exper. Biol. & Med. 59: 148–150, June 1945.

[3] Neefe, J. R., Gellis, S. S., and Stokes, J., Jr.: Homologous Serum Hepatitis and Infectious (Epidemic) Hepatitis: Studies in Volunteers Bearing on Immunological and Other Characteristics of the Etiological Agents. Am. J. Med. 1: 3–22, July 1946.

Other experiments which tended to differentiate the two diseases, serum hepatitis and infectious hepatitis, were the unsuccessful attempts to demonstrate the virus of serum hepatitis in the feces of patients in the acute phase of the disease. In addition, serum hepatitis has not been transmitted experimentally by the oral route with two possible exceptions. The incubation period of infectious hepatitis was shown to be rather consistently from 20 to 30 days, and perhaps as long as 45 days, but the incubation period of serum hepatitis has been from 60 to 154 days (chart 5). Apparently, in serum hepatitis, the period of viremia before the development of clinical symptoms of liver disease is very long. Neefe and coworkers recovered virus from the blood 87 days before the onset of jaundice; Paul and coworkers detected virus in the blood 60 days before the appearance of jaundice, and Havens found them 16 days before the appearance of jaundice. Attempts to detect virus in the blood during convalescence (as in infectious hepatitis) were unsuccessful when the tests were made at intervals of 1 to 5 months after the onset of the disease (table 52). These limited experimental findings should not be interpreted as indicating that a convalescent or postconvalescent carrier state does not exist in viral hepatitis. Indeed, since 1945 there have been observations, largely unpublished, which indicate that an occasional soldier or ex-soldier with a history of jaundice or of exposure to jaundice during the war has apparently harbored the virus for years and his carrier state has become manifest when a recipient of his blood has become jaundiced.

CHART 5.—*A comparison of incubation periods of infectious hepatitis and homologous serum jaundice observed in a series of experimental cases*

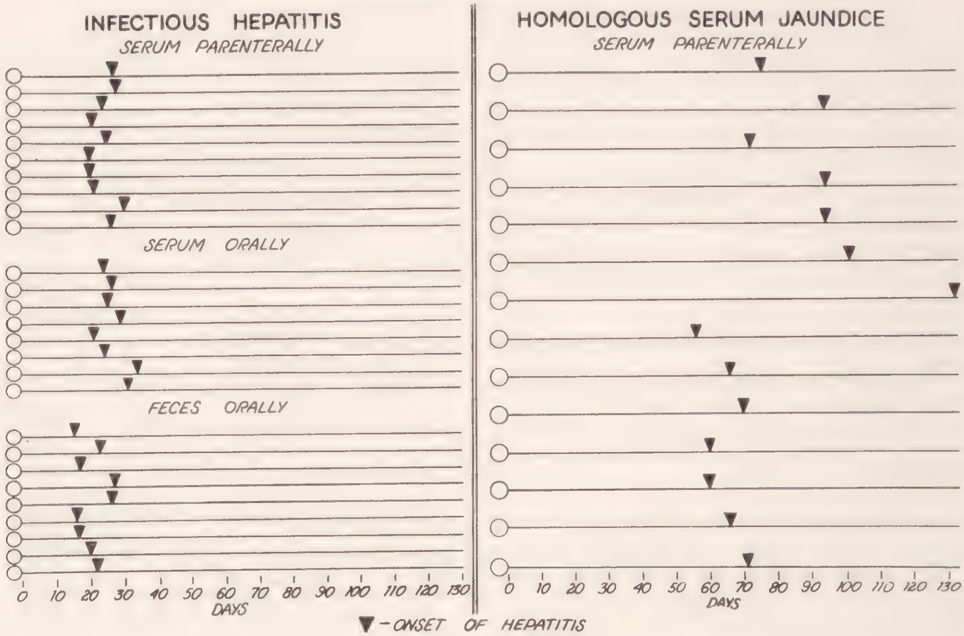


TABLE 52.—*Results of administration, to volunteers, of materials obtained from patients in various stages of the incubation period and convalescence of serum jaundice*

[The minus sign = before onset of disease; the plus sign = after appearance of jaundice]

Authors	Year	Day material was obtained	Volunteers	
			Inoculated	Jaundiced
			Number	*Number*
Neefe et al [1]	1944	−87	2	[2] 2
Paul et al [3]	1945	−60	8	3
Havens [4]	1946	−16	4	1
Havens [4]	1946	28 to 32	5	0
MacCallum & Bauer [5]	1944	66+	5	0
MacCallum & Bauer [5]	1944	141+	5	0
Oliphant et al [6]	1943–44	75 post jaundice	15	0

[1] Neefe, J. R., Stokes, J., Jr., Reinhold, J. G., and Lukens, F. D. W.: Hepatitis Due to the Injection of Homologous Blood Products in Human Volunteers. J. Clin. Investigation 23: 836–855, September 1944.

[2] No definite statement of jaundice.

[3] Paul, J. R., Havens, W. P., Jr., Sabin, A. B., and Philip, C. B.: Transmission Experiments in Serum Jaundice and Infectious Hepatitis. J.A.M.A. 128: 911–915, 28 July 1945.

[4] Havens, W. P., Jr.: The Period of Infectivity of Patients With Homologous Serum Jaundice and Routes of Infection in This Disease. J. Exper. Med. 83: 441–447, June 1946.

[5] MacCallum, F. O., and Bauer, D. J.: Homologous Serum Jaundice; Transmission Experiments With Human Volunteers. Lancet 1: 622–627, 13 May 1944.

[6] Oliphant, J. W., Gilliam, A. G., and Larson, C. L.: Jaundice Following Administration of Human Serum. Pub. Health Rep. 58: 1233–1242, 13 Aug. 1943.

MEDITERRANEAN AREA AND MIDDLE EAST THEATER

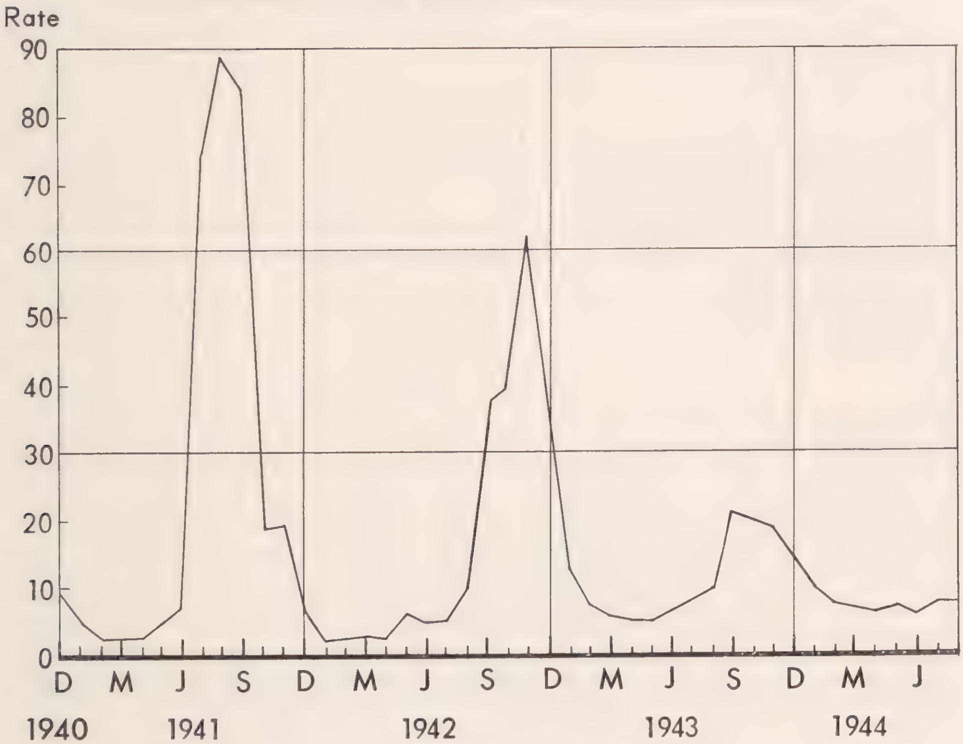
In no areas did the problem of infectious hepatitis reach greater proportions than in North Africa, in the Middle East, and in Sicily and Italy during the period 1943–45. The problem in this region deserves special mention.

British Experience in Mediterranean, 1941–42

Shortly after U.S. troops arrived in Egypt in the fall of 1942, and in Morocco and Algeria after the North African landings in early November 1942, it was learned first hand from British medical officers that "infective hepatitis," to use the British term, was indeed a very serious problem in their troops. As mentioned before, the British were familiar enough with epidemic hepatitis in that part of the world, and no doubt they were not surprised to see its return in 1940. In both 1941 and 1942, the hepatitis season coincided with the period of severe fighting in the North African desert. In the 1942 epidemic, there was an abrupt rise in incidence in August with a further rise in October, and a peak was reached in November (chart 6). There were regiments in the British Eighth Army, for example, in

CHART 6.—*Monthly incidence rates for infectious hepatitis in British troops in the Middle East, December 1940 to August 1944*

[Rate expressed as number of cases per annum per 10,000 average strength]



which 8 or 9 percent of the total strength was ineffective because of hepatitis. Often, as many as one-third of a regiment's officers were involved, for officers contracted the disease at a rate of four to five times that of other ranks.[41]

The 1942 epidemic in North Africa occurred at a very crucial time for the British since it started in early October, which was just when the British counteroffensive at El Alamein began. It soon was apparent that a period of duty amid the highly unsanitary conditions along the Alamein Line was a predisposing cause of the epidemic. The disease also developed among the Italian prisoners captured there at the time. In Kirk's[42] study of this situation, emphasis was laid on the possibility that the disease was flyborne. Flies were present at the time of the epidemic in enormous numbers, and the ground was filthy with excreta and imperfectly buried German and Italian corpses. The disease did not appear to spread later in general hospitals, base camps, or prisoner-of-war cages, where sanitation was good and fly control considered satisfactory. This indicated to observers that contact alone was insufficient to spread the disease. With this experience fresh in their minds, various British medical officers expressed themselves verbally as believing the military evidence to indicate that infective hepatitis was spread by feces. The British group, and in particular Maj. C. E. van Rooyen, R.A.M.C., who was stationed at that time in Cairo, was anxious to try experiments on volunteers to prove this hypothesis, but the opportunity to carry out such experiments did not arise. In May 1943, Major van Rooyen expressed his views to a team of investigators, members of the Neurotropic Virus Diseases Commission of the Board for the Investigation and Control of Influenza and Other Epidemic Diseases in the Army.[43] This team had been sent to Cairo early in 1943 by the Preventive Medicine Service to investigate epidemiological and other features of disease of military importance in the Middle East, such as sandfly fever, poliomyelitis, and infectious hepatitis. During the spring and summer of 1943, however, hepatitis was no problem to the U.S. forces in the Mediterranean area, although this situation was not to last long.

Experience of U.S. Forces, 1942–45

During the fall and winter fighting of 1942 to 1943 (chart 7) in Algeria and Tunisia, and all through the spring and early summer of 1943,

---

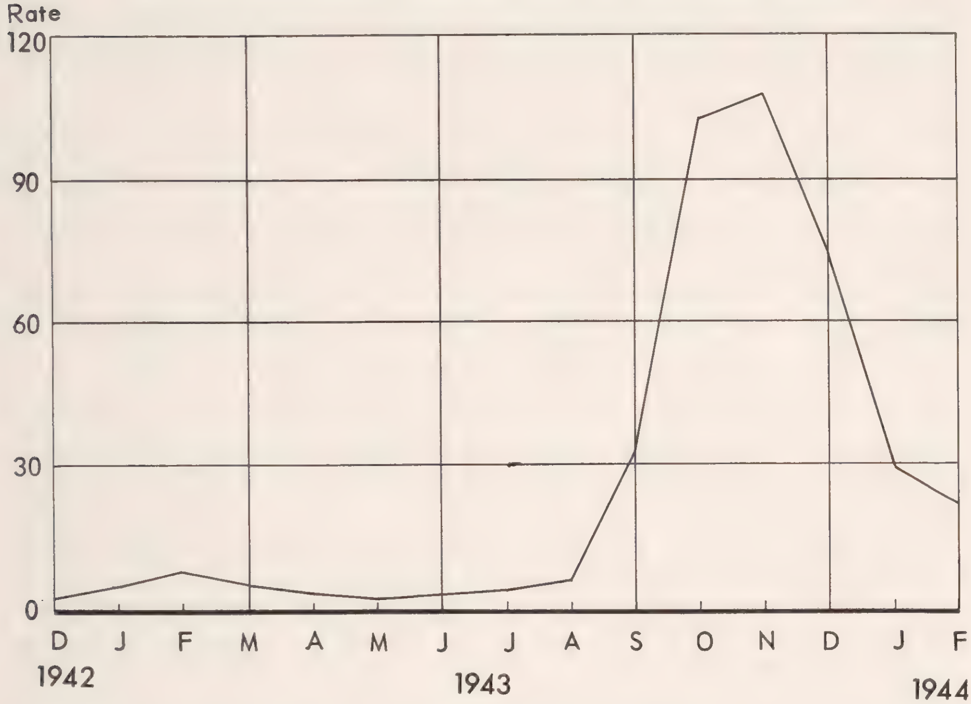
[41] Spooner, E. T. C.: The 1942 Epidemic of Infective Hepatitis in the Middle East. Proc. Roy. Soc. Med. 37: 171–172, February 1944.

[42] Kirk, R.: Spread of Infective Hepatitis. Lancet 1: 80–81, 20 Jan. 1945.

[43] Members of this team included Dr. John R. Paul, Director; Maj. (later Lt. Col.) Albert B. Sabin, MC; Maj. (later Col.) Cornelius B. Philip, SnC; and Capt. (later Maj.) W. Paul Havens, Jr., MC. The Commission, known in the U.S. Army Forces in the Middle East and in the Mediterranean Theater of Operations, U.S. Army, as the Virus Commission, had its headquarters, laboratories, and experimental ward established in May-December 1943 at the 38th General Hospital in the Desert Camp, Russel B. Huckstep, outside Cairo, Egypt. Here the first transmission experiments on sandfly fever virus, to be conducted under U.S. Army auspices, were carried out, experiments which also resulted in the inadvertent transmission of serum hepatitis virus to volunteers.

CHART 7.—*Monthly incidence rates for infectious hepatitis among U.S. Army troops in the North African Theater of Operations, December 1942 to February 1944*

[Rate expressed as number of cases per annum per 1,000 average strength]

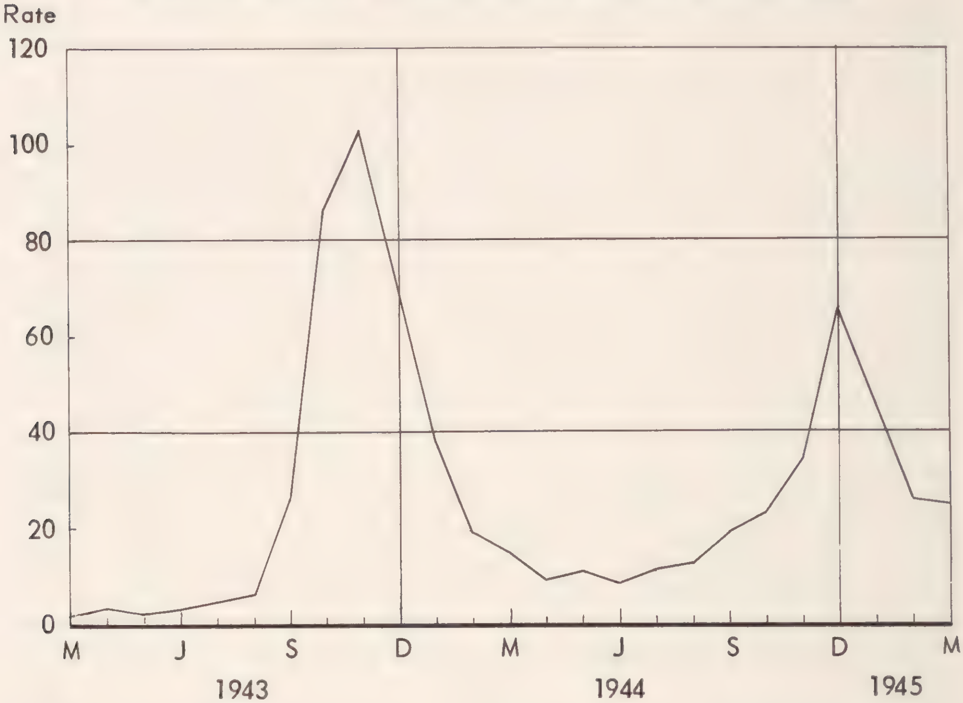


the relative number of hepatitis cases among local U.S. forces in the Mediterranean theater, as opposed to U.S. Army Forces in the Middle East, was insignificant (chart 8). The incidence of hepatitis was very low in North Africa at that time in comparison with its later magnitude. The situation was a little different in Egypt where the troops had arrived earlier. There, although the number of troops was small, the rate was appreciable. The annual admission rate (June through December 1942) for the Middle East theater, which included Egypt, was 16.7.

This freedom from infectious hepatitis during the first year of the North African occupation was merely a calm before the storm. Starting late in the summer of 1943, close to the time of the invasion of Sicily, the incidence of the disease rose to unprecedented heights. It presented very serious problems to the officers of the Medical Department who were suddenly confronted during combat with an enormous number of cases of a disease for which the means of spread were not clearly understood, no methods of prevention were known, and no specific therapy was available. Clinically, however, this disease was quite similar to catarrhal jaundice or postvaccinal jaundice (serum hepatitis) with which the Army had had all

CHART 8.—*Monthly attack rate for infectious hepatitis in U.S. Army troops in the North African and Mediterranean Theaters of Operations, March 1943 to March 1945*

[Rate expressed as number of attacks per annum per 1,000 average strength]



too much recent experience. In that respect at least, the disease was not entirely new as a clinical problem in military medicine.

Cases of hepatitis began to appear almost simultaneously among troops in Egypt, North Africa, and Sicily. By October and early November the number of cases had reached great proportions, and hospitals in Cairo,, Algiers, Tunis, and Palermo, Sicily, were overflowing with hepatitis patients. The outbreak involved U.S. and British troops alike. The size of the epidemic and the number of admissions for these diseases during each of the years 1942–45 in the Mediterranean and the Middle East theaters is shown in table 53.

The responsibility of caring for all these patients in the fall and winter of 1943–44 was enormous, carried on, as it was, just in the rear of combat areas. To accomplish the task of quickly devising means of control seemed impossible at that time, but attempts to do so were made. Early in September 1943, just at the time of the landings at Salerno, Italy, and soon after the beginning of the epidemic of hepatitis, Brig. Gen. James S. Simmons, Chief, Preventive Medicine Service, Office of the Surgeon General, representing the Army Epidemiological Board, visited Sicily, North Africa, and Egypt. At Cairo, he made the special request that the Neuro-

tropic Virus Diseases Commission there concentrate its attention on epidemiological and etiological aspects of infectious hepatitis.[44]

TABLE 53.—*Admissions for infectious and serum hepatitis among U.S. troops in the Mediterranean and Middle East theaters, by year, 1942–45*

[Preliminary data based on tabulations of individual medical records and summaries of statistical health reports]

[Rate expressed as number of admissions per annum per 1,000 average strength]

Year	Mediterranean theater		Middle East theater	
	Number of admissions	Rate	Number of admissions	Rate
1942	41	1. 79	101	16. 71
1943	18, 613	40. 75	302	5. 69
1944	11, 794	18. 16	296	6. 40
1945	7, 035	19. 88	240	5. 87

At this time, the approach of investigators to the study of the Mediterranean epidemic of hepatitis was quite naturally colored and considerably confused by their recent experience during the outbreak of postvaccinal or serum hepatitis in the United States during 1942. Various theories current in 1943 as to how the military disease might be spread and controlled included the following: (1) That it was a contact disease spread by droplet infection and that measures conceivably useful in the control of respiratory disease should be considered; (2) that it was transmitted through the agency of human excrement and spread primarily through human carriers of the virus, as is typhoid fever; (3) that some unknown, extrahuman factor, such as rodents, insects, or pigs, was responsible for its spread; (4) that the disease was an example of bacterial warfare; and (5) that it was due to or made worse by malnutrition and inadequate diets.

As a result of a series of epidemiological observations on the part of members of the aforementioned commission, including observations in connection with a field trip to Algiers, Sicily, and Tunis in November 1943, the following points had become apparent:

1. The incubation period of this "Mediterranean epidemic hepatitis" was much shorter than that of serum hepatitis, being about 18 to 25 days instead of about 90 days. The situation was complicated by the fact that serum, or long incubation period, hepatitis was also present in that general area. Serum hepatitis had already been demonstrated in Cairo, experimentally by Cameron [45] in 1942, and inadvertently in 1943 by the frequency

[44] The Neurotropic Virus Diseases Commission included at this time the members already mentioned (p. 444). Medical officers who participated in these discussions and plans and later helped to implement the field studies and laboratory investigations included Col. (later Brig. Gen.) Crawford F. Sams, MC; Lt. Col. (later Col.) Thomas G. Ward, MC, USAFIME, and Col. W. S. Stone, MC, NATOUSA.

[45] Cameron, J. D. S.: Infective Hepatitis. Quart. J. Med. 12: 139–155, July 1943.

with which arsphenamine jaundice occurred in certain clinics. The disease had also been demonstrated by the Commission in Cairo in their transmission experiments on sandfly fever (p. 444).

2. The disease was not well known by native physicians except as a children's disease and was very uncommon in native adults.[46] These facts suggested that, as in poliomyelitis, the native population was largely immune as a result of childhood or infantile infection.

3. A number of patients (U.S. soldiers) seen in U.S. military hospitals in the fall and winter of 1943–44 had had serum (post-yellow-fever vaccine) hepatitis in 1942 in the United States, indicating that a previous attack of serum hepatitis did not confer even short-term immunity for "Mediterranean infectious hepatitis."

4. Epidemics of infectious hepatitis were of great severity in various tactical units, particularly in the Air Forces, with attack rates which occasionally ran as high as 25 or 30 percent of the entire strength of the command. These attack rates represented patients who were actually jaundiced. There might well have been an equal percentage of men who simultaneously acquired the nonicteric form of the disease, resulting in a high noneffective rate.

5. There had been a tendency to associate outbreaks of dysentery with those of hepatitis in some units, although in the great majority of instances the dysentery outbreak came first, in July and August, and was followed in September and October with a straggling outbreak of hepatitis. This experience recalls the experience of 25 years before among the French and British armies in the Dardanelles during World War I (p. 417), when French army officers expressed the belief that epidemic jaundice might be a complication of various enteric infections. That the two conditions coexisted in many military units in the summer of 1943 in North Africa and Italy, there was no doubt, but an analysis of the situation usually revealed a fairly wide separation in time between the incidence peak of dysentery and that of hepatitis.

In this connection, in certain Air Force units, the story of acquisition of either dysentery or hepatitis in North Africa or Sicily in 1943 was often the same. An enemy airfield or a series of fields was captured, and the U.S. unit moved in with all possible speed. The field was found to be very dirty. Damaged latrines were used first by the occupying unit and then were gradually cleaned up and repaired. This seemed an ideal situation for bacterial warfare with an intestinal disease, and the matter of damaged or soiled latrines was often discussed in this light.

---

[46] In 1944, a number of native, adult cases of viral hepatitis were seen in an Egyptian military hospital in Cairo, where a special ward was designated at that time as a Hepatitis Ward. It is of some epidemiologic significance to recall that nearly all the military patients in this ward were soldiers who had been born and brought up in outlying Egyptian villages and not in big cities.—J. R. P.

With these epidemiological observations at hand, it seemed to the Commission that if any methods to prevent or control hepatitis among troops in Italy were to be devised, certain experiments to establish the means of transmission of infectious hepatitis would be necessary. Accordingly, in February 1944 this unit returned to the United States bringing infectious materials (blood, feces, et cetera) collected in the epidemic area. Under the auspices of the Army Epidemiological Board, a laboratory for the study of acute hepatitis was established in the Section of Preventive Medicine of the Yale University School of Medicine which contributed to efforts to solve some of the complex problems that hepatitis presented to military medicine. Among other groups working on this problem under the auspices of the Army Epidemiological Board at that time was the laboratory established in connection with the Children's Hospital of Philadelphia under the direction of Dr. Joseph Stokes, Jr., Professor of Pediatrics, University of Pennsylvania, and Director of the Commission on Measles and Mumps. The contribution of Dr. Stokes' group in this infectious hepatitis study is noteworthy (p. 438).

By this time, it was quite clear to the Army Epidemiological Board that hepatitis in the Mediterranean area was a military disease of considerable magnitude. Consequently, the services of consultants were enlisted. Dr. Thomas Francis, Jr., Director of the Commission on Influenza, was sent by the Office of the Surgeon General to Italy in April 1944 to report further on the situation in respect to hepatitis. In the fall of that year a third consultant group consisting of Dr. Stokes, and Capt. Sidney S. Gellis, MC, of the Commission on Measles and Mumps, also visited this theater. They were charged with the special mission of attempting to determine the relative value of gamma globulin injections as a preventive measure for infectious hepatitis in troops heavily exposed to this disease.

In the meantime, medical officers of the Mediterranean theater had been quick to set up a clinical and research unit on hepatitis in Naples, Italy, in connection with the 12th General Hospital and the 15th Medical General Laboratory there.[47] This unit was started late in the fall of 1943. It reported a number of clinical studies on acute and subacute hepatitis which were based upon a large series of clinical cases and which emphasized for the first time the tendency of the disease to become chronic in a relatively small percentage of cases characterized by a protracted illness or relapse.

The campaign in Italy was one of the longest for U.S. troops during the war, lasting for approximately 18 months, from September 1943 until the Armistice in May 1945. In particular, the winter of 1943–44 was a

[47] The following officers were identified with the clinical and research unit at Naples in 1944–45: Col. Marion H. Barker, MC, Chief, Medical Service, 12th General Hospital; Maj. (later Lt. Col.) R. B. Capps, MC; Capt. H. B. Wilson, MC; Lt. Col. Tracy B. Mallory, MC, Chief, Pathology Section, 15th Medical General Laboratory; and Capt. (later Maj.) F. C. Robbins, Chief, Virus and Rickettsial Section.

period of bitter fighting in bad weather over difficult mountainous and marshy terrain. The next fall and winter, 1944–45, the hepatitis rate again soared to high levels, although it did not reach the peak which it had attained in the fall of 1943.

The whole epidemiological story of hepatitis in MTOUSA has been exceedingly well documented by Gauld.[48] There are certain aspects of this story which may bear reiteration. During the period 1943–45, infectious hepatitis proved to be the greatest cause of disabling illness among U.S. forces in the Mediterranean and North African theaters. It also ranked as one of the chief medical causes of death even though the actual case fatality rate, about 1.8 per 1,000, was not high. The British experience was in many respects similar, whereas Brazilian troops apparently escaped infection. French Arab troops serving in Italy in 1943 seemed to be free of the disease, but its incidence was high among them in 1944. In general, however, the high incidence was found in troops from Europe and the United States who came as susceptible immigrants into this endemic area.

The seasonal distribution of the disease among U.S. troops in this area is important (chart 8). It will be seen that the seasonal upswing began in August in both 1943 and 1944 and that the peaks occurred in November and December respectively. This curve may be compared with that representing British experience in North Africa in which the peak occurred earlier in the year (chart 6). It should be pointed out that British armies were operating in 1941 and 1942 in warmer climates along the North African front. As shown by Gauld, the seasonal increase in the German Army also began earlier, if one may judge by the monthly incidence of hepatitis in the *Fourteenth German Army* as presented in a captured document (chart 9). Gauld believed that the seasonal distribution in U.S. troops was strongly suggestive of a respiratory mode of spread rather than of transmission either through the gastrointestinal tract or by an insect vector. However, he also believed that there was no doubt that the disease could be spread by filth and that one outbreak of hepatitis in the 86th Mountain Infantry Regiment appeared to have resulted from the drinking of contaminated well water. It seemed quite possible to him that some, if not all, of the explosive outbreaks were similarly spread.

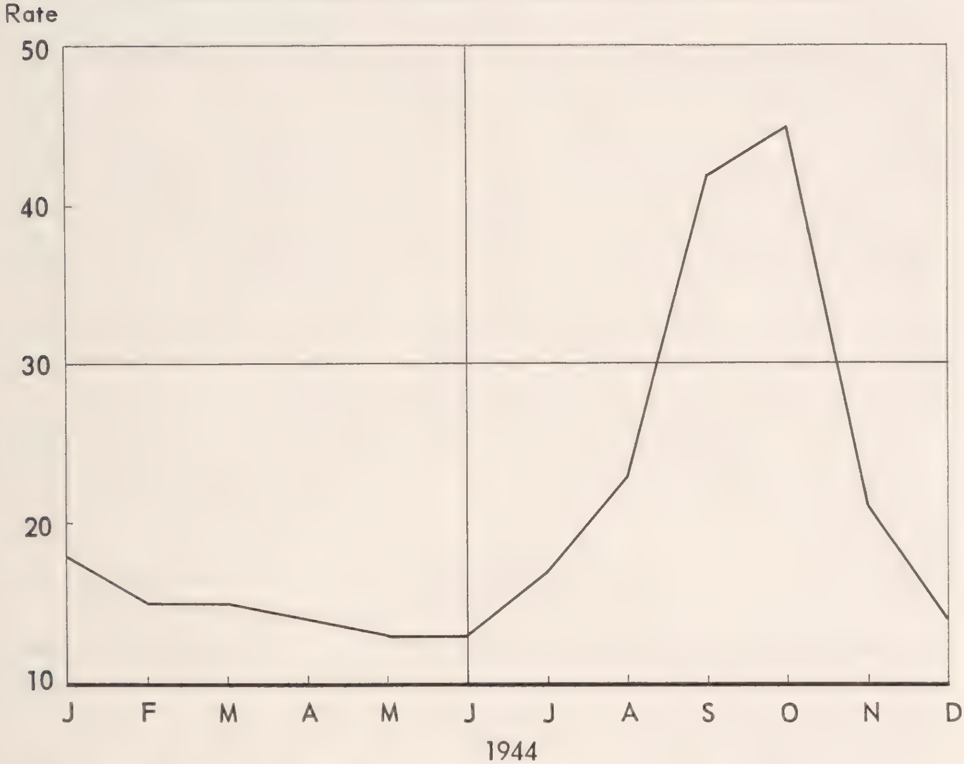
Gauld found that a certain degree of immunity to hepatitis was manifested in seasoned troops. He further observed that there was a decrease in the relative incidence of the disease as the age of individual soldiers advanced. Of significance also was his confirmation of the fact that men who had been vaccinated against yellow fever in 1941–42 and who had acquired serum hepatitis at that time were not protected from acquiring infectious hepatitis later. Indeed, the attack rate among such men was significantly higher than among others.

---

[48] Gauld, R. L.: Epidemiological Field Studies of Infectious Hepatitis in the Mediterranean Theater of Operations, I–VIII. Am. J. Hyg. 43: 248–313, May 1946.

CHART 9.—*Monthly attack rates for infectious hepatitis in the* Fourteenth Army (*German*), *1944*

[Rate expressed as number of attacks per annum per 1,000 average strength]



In brief, the story of infectious hepatitis among U.S. troops in combat in the Mediterranean area is one of a severe and protracted epidemic which occurred in two waves during 2 successive years and produced 40,000 cases. The 1943 epidemic is an outstanding example of what happens when susceptible troops occupy an endemic area during the summer, it being apparent that hepatitis is endemic in the eastern half of the Mediterranean littoral.

EUROPEAN THEATER OF OPERATIONS

Serum Hepatitis

In common with all other theaters of operations and the continental United States, the European theater also experienced an outbreak of serum hepatitis in 1942.[49] On 13 May 1942, word was received by the Chief Surgeon, ETOUSA (European Theater of Operations, U.S. Army), from the Department of Health for Scotland that among the troops arriving at Glas-

[49] Gordon, J. E.: A History of Preventive Medicine in the European Theater of Operations, U.S. Army, 1941–45. [Official record.]

gow there were 26 cases of jaundice. As these cases appeared in a shipment of 20,000 troops, the health authorities in Scotland believed that the disease was probably infectious but not epidemic and allowed them to proceed to their destination in Northern Ireland where investigations were begun on 20 May by members of the American Red Cross-Harvard Field Hospital Unit. By this time the outbreak involved some 86 soldiers. It should be pointed out that although The Surgeon General had caused the yellow fever vaccine containing human serum to be withdrawn on 15 April, word had not reached individual theaters (at least the lower echelons) of the nature of the outbreak of jaundice because the circular letter from The Surgeon General (Circular Letter No. 45) was not published until 13 May 1942. It was believed that widespread knowledge of the incriminated yellow fever vaccine was of potential value to the enemy and also that it might affect adversely the morale of troops being vaccinated at staging areas and ports of embarkation in the United States.

Epidemiological and laboratory investigation of this outbreak was begun immediately, and medical officers who had arrived from the United States with the affected troops were able to inform the Division of Preventive Medicine, ETOUSA, of the large number of cases of jaundice which had by then begun to appear in the Army stationed in the United States. The relationship of the outbreak to the various lots of yellow fever vaccine was studied, and it was found that the attack rate was higher with certain lots than with others; for example, the percentages of those infected by lots numbers 338, 351, and 368 were 25, 13, and 15, respectively. The maximum incidence was at about the 14th week after inoculation, and cases were grouped symmetrically about that point. Through the cooperation of the Wellcome Research Institution in London, attempts were made to inoculate animals by means of the blood of patients. Monkeys, mice, embryonated eggs, and chick embryo tissue cultures were inoculated with the blood from patients, but the results were completely negative. Material from a fatal case was also negative. A comparison of the yellow fever neutralizing antibodies in patients with serum hepatitis and in English soldiers who had been inoculated against yellow fever, by means of 6-week-old Swiss mice and the intraperitoneal mouse protection test, showed no essential difference between the two groups.

The total number of cases in this outbreak of postvaccinal hepatitis was 1,915, of which 1,591 occurred in Northern Ireland and 324 in Great Britain.[50] Because of the great difference in numbers of troops stationed in Northern Ireland and Great Britain, the attack rates were approximately the same in both areas. Although the vast majority of these cases could be directly associated with inoculation with one or another lot of yellow fever vaccine, some of the 1,915 cases may have represented infectious hepa-

---

[50] Figures for this outbreak of postvaccinal hepatitis in the United Kingdom were drawn from individual units by a special team of investigators from the Preventive Medicine Division, Office of the Chief Surgean, ETOUSA.

titis, but the extent to which this was so cannot be ascertained with any certainty. As noted before, infectious hepatitis was not reportable on the statistical health report until 22 May 1942.

Iceland also experienced an epidemic of serum hepatitis. By 1 September 1942, approximately 1,320 patients had been hospitalized for jaundice, and about 200 more jaundice patients had been treated in quarters. Most of the cases occurred in troops who had arrived in Iceland during March and April 1942 and who, with a few exceptions, had been vaccinated against yellow fever with lot number 368. There were no deaths in Iceland.

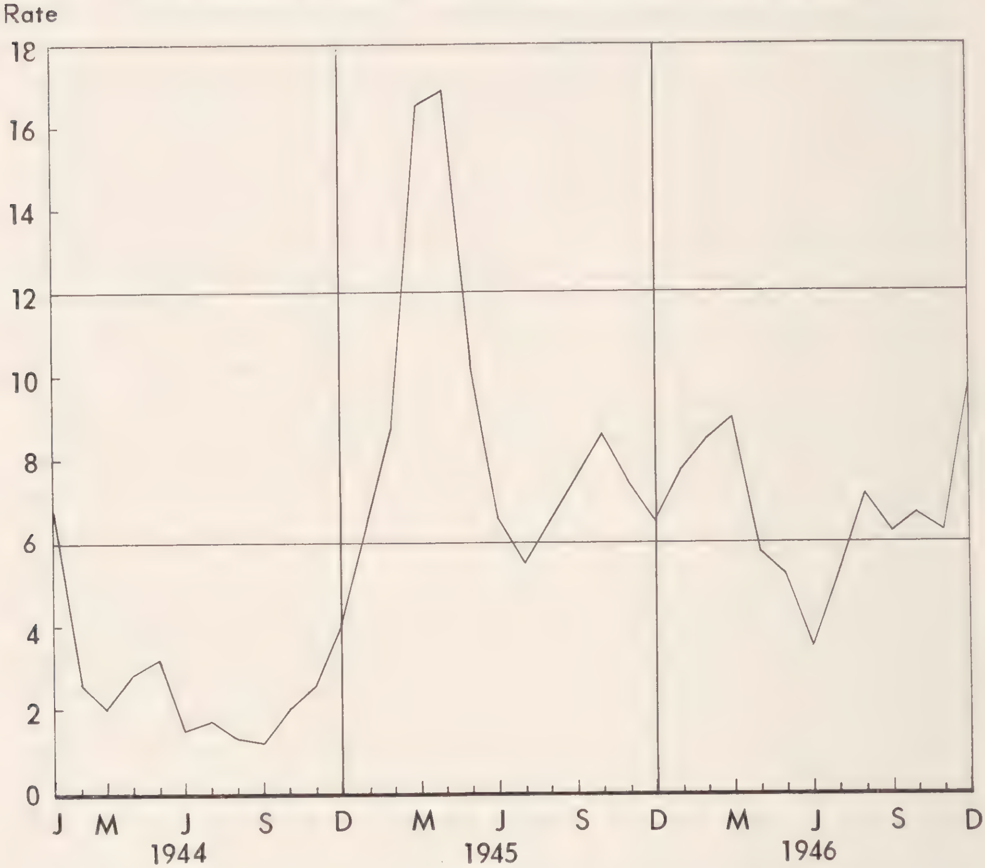
The total number of cases of serum hepatitis in Europe and Iceland in 1942 was approximately 3,435. Two deaths occurred, both of them in Great Britain. Serum hepatitis did not again become a serious problem until 1944 when transfusions of blood and blood products became common due to the number of casualties occurring on the Continent. By this time, the Army was well aware of the danger. Studies made early in the war by the British Ministry of Health and the jaundice committee of the British Medical Research Council had adequately established the difference in jaundice rates among transfused wounded and untransfused wounded in emergency hospitals.

Infectious Hepatitis

After the subsidence of the yellow fever vaccine-induced epidemic by September 1942, the rate of hepatitis (presumably infectious hepatitis) was maintained in the European theater at relatively low levels, varying between 2 and 5 cases per 1,000 per annum, until the end of 1943. There was a sharp rise in rate in November and December 1943, shortly after the arrival of troops from the epidemic area in Italy. These troops comprised 4 infantry divisions and the First Engineer Special Brigade which were to form the nucleus of the First U.S. Army. A month or so after their arrival in England, the rate for U.S. troops in the United Kingdom rose to about 12.9 cases per 1,000 per annum, and this cadre experienced the highest incidence of the disease. Due perhaps to the sanitary facilities available in England, which even during maneuvers amounted to a garrison type of sanitation, there was no great spread of hepatitis to other troops training in England. However, the seeding of men from these organizations throughout the First U.S. Army might have played a significant role in the spread of hepatitis later during combat in Europe when such sanitary facilities were not available. Fortunately, the infection did not spread in the First U.S. Army, and hepatitis was never a great problem in that army, the rate remaining below 3 cases per 1,000 per annum until the spring of 1945 when, as in other armies in all theaters, there was an increased incidence, and the rate rose to 12 cases per 1,000 per annum (chart 10). There had been a sharp rise to 17 cases per 1,000 in the fall of 1944 and the winter of 1944–45, which had been in keeping with the experience at that season in Italy a year

CHART 10.—*Monthly incidence rates for hepatitis in the European Theater of Operations, January 1944 to December 1946*

[Rate expressed as number of cases per annum per 1,000 average strength]



earlier. This characteristic seasonal upswing suggested infectious hepatitis rather than serum hepatitis.

The manner in which hepatitis spread among U.S. armies on the Continent is interesting. The disposition of the armies advancing toward the east through Europe in 1944 and 1945 was approximately as follows: The Seventh U.S. Army occupied the southernmost position with the Third U.S. Army on its left flank. The First U.S. Army was on the left flank of the Third Army, and the Ninth U.S. Army was at the far end of the line in Holland. Interchange of units and personnel among these armies was greatest between the Seventh and Third and was somewhat less between the First and Seventh.

The Seventh Army is of the greatest interest with respect to infectious hepatitis during 1944 and 1945. The epidemic spread in U.S. troops on the Continent was chiefly in this army and, as might be expected, in those units

of the other armies; that is, the Third and First Armies, which were in contact with it.

The Seventh Army was made up of a nucleus of infantry divisions which had been a part of the Fifth Army in Italy; namely, the 3d, 36th, and 45th Infantry Divisions. These divisions had had considerable experience with hepatitis, and jaundice was still common among them when they invaded southern France on 15 August 1944. Hepatitis in the Seventh Army was thoroughly studied by Gauld who concluded that the infection had been introduced into the European theater by troops which had previously served in North Africa or Italy.

TROPICAL AND SUBTROPICAL AREAS

The Pacific

General considerations.—Tactically, the character of the campaign in the Pacific from August 1942 until August 1945 differed from that of other theaters of war, in that operations consisted of the introduction of various types of U.S. troops onto islands of different sizes and into populations of diverse types among whom the endemicity of infectious hepatitis varied. The character of the introduction of the troops into the islands varied from some of the most difficult and hard-fought landing operations in the whole war to the relatively easy occupation of smaller islands from which the Japanese had withdrawn. These differences created epidemiological problems different from those encountered in North Africa, the Middle East, Italy, and Europe. When it is remembered that the statistics for such a theater as SWPA (the Southwest Pacific Area) were drawn from the Philippines, the Netherlands East Indies, New Guinea, and the major part of the Solomons, as well as the mainland of Australia, it is obvious that the situations which they represent were various from the standpoint of epidemiological significance, and that more significant findings might be anticipated from more discrete studies of epidemics or outbreaks in individual islands or in individual units. Actually, the hepatitis rates in the Southwest Pacific steadily increased throughout the war until, in 1945, both the rate and the total number of troops affected were greater than in any other theater (chart 11). Unfortunately, the number of published studies concerning individual outbreaks or groups of cases were small, at least in comparison with the studies of Barker and his coworkers,[51] of Gauld,[52] and of Havens.[53] Furthermore, the Army Epidemiological Board commissions made no studies on hepatitis in the Pacific area.

---

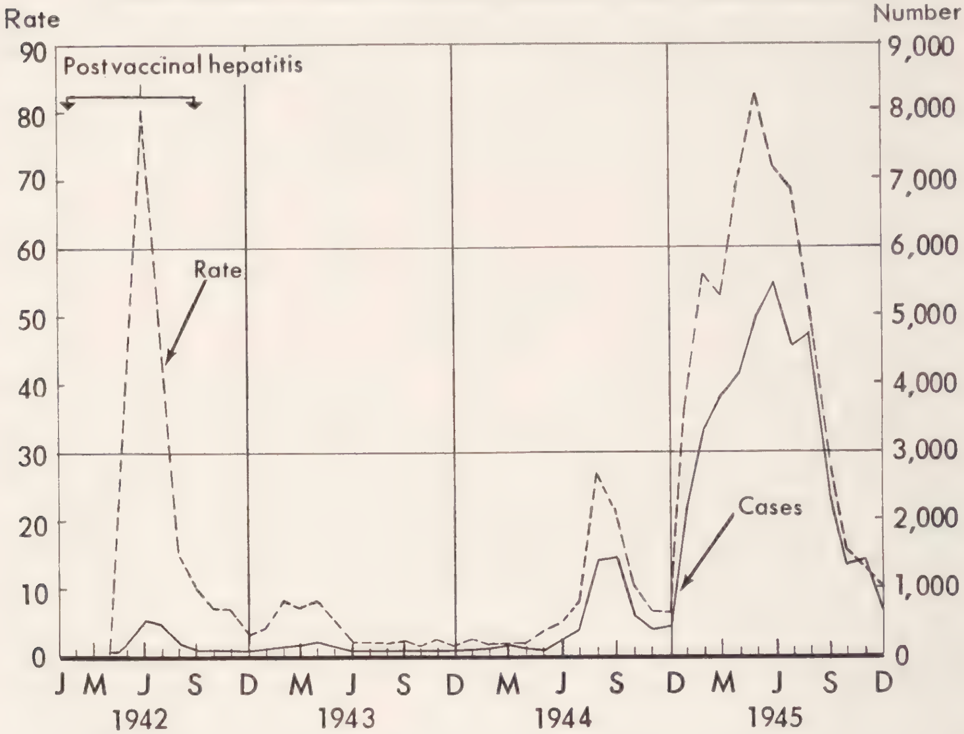
[51] (1) Barker, M. H., Capps, R. B., and Allen, F. W.: Acute Infectious Hepatitis in the Mediterranean Theater; Including Acute Hepatitis Without Jaundice. J.A.M.A. 128: 997–1003, 4 Aug. 1945. (2) Barker, M. H., Capps, R. B., and Allen, F. W.: Chronic Hepatitis in the Mediterranean Theater of Operations; A New Clinical Syndrome. J.A.M.A. 129: 653–659, 3 Nov. 1945.

[52] Gauld, R. L.: Field Studies Relating to Immunity in Infectious Hepatitis and Homologous Serum Jaundice. Am. J. Pub. Health 37: 400–406, April 1947.

[53] Havens, W. P., Jr.: Epidemiological Studies on Infectious Hepatitis. Am. J. Pub. Health 36: 37–44, January 1946.

CHART 11.—*Hepatitis cases and incidence rates in the Southwest Pacific Area, January 1942 to December 1945*

[Rate expressed as number of cases per annum per 1,000 average strength]



In SWPA, there were two well-defined examples of increased rates of hepatitis (including both infectious and serum hepatitis) which reached epidemic proportions. The first, in 1942, was characterized by a very high admission rate in the relatively small number of U.S. troops in Australia. This outbreak was associated with postvaccinal (yellow fever) hepatitis. The second, which began in May 1944, involved troops in a number of areas, notably Biak Island; the New Guinea towns of Hollandia, Aitape, and Finschhafen; and the Admiralty Islands. The latter outbreak reached its height about August 1944 and declined sharply until the late fall when it began a dizzy and spectacular rise throughout the winter months to the following May. Rates for the theater exceeded 82 per 1,000 per annum. The tremendous importance of infectious hepatitis in this theater is indicated by the fact that, during the year 1944, 5,025 patients were treated for the disease, and in his report for that year the Chief Surgeon estimated that, if 17 man-days were lost per individual treated (a conservative estimate), approximately 85,425 man-days were lost. In 1945, some 39,277 cases were treated, and 667,709 man-days lost.

Investigation of individual outbreaks.—The outbreak on Biak Island was investigated by Maj. James L. Borland, MC. At the direction of the Commanding General, Sixth U.S. Army, Major Borland studied in October 1944 an outbreak involving some 1,500 cases of infectious hepatitis which occurred between 1 June 1944 and 13 October 1944. The epidemic involved several different units on Biak which had different mess, latrine, and water-point facilities and were separated geographically by some distance. The cases began to occur in each unit at approximately the same time, and the peak was reached at the same time in the several units. There was no evidence of spread within the tents of a given unit; the outbreak was spotty and demonstrated no constant time relationship between initial and subsequent cases within the unit affected. However, Borland noted that there was a geographic similarity between the units chiefly involved, in that they were situated along two rows of cliffs which had been cleared of brush and cover about 6 weeks before the peak of the epidemic. In the units which had moved into bivouac areas that had been cleared previously, there were practically no cases, while in headquarters groups which tended to locate in areas with cover and to retain the cover, there was a relatively higher incidence. From his investigations, Borland concluded that the disease could not have been spread by contact but may have been spread by a vector, either a small night-biting phlebotomus or the common fly. Unfortunately, no accurate entomologic assistance was available, and the area had been fairly well cleared by the time the investigation was under way. It is of some interest that in this epidemic there was a concomitant outbreak of a 2- to 3-day fever indistinguishable from the fever associated with the early stages of the hepatitis. Borland attempted the transmission of hepatitis to ferrets, guinea pigs, and white mice without success.

Although this study did not contribute to fundamental knowledge of the disease, the suggestion of transmission by a night-biting gnat or phlebotomus should not be lightly dismissed, as it is theoretically possible that just as the syringe or needle may transmit serum hepatitis by minute quantities of serum, so may mechanical transfer by means of biting insects be one means of spread of infectious hepatitis. This possibility was also suggested by other investigators.

The outbreak in Hollandia from August to October 1944 was studied by Maj. Ray E. Trussell, MC,[54] and a report of this investigation has been published. This outbreak embraced 100 cases in 6 small military units. Trussell's conclusions were that the most likely mode of spread was the mechanical transference of the infectious agent by flies from infected feces, and by food-handlers, utensils, dishwater, and food in the most severely affected unit. This more orthodox interpretation of the means of spread may well have

[54] Trussell, R. E.: Epidemiologic Aspects of an Outbreak of Infectious Hepatitis. Am. J. Hyg. 45: 33–42, January 1947.

559625v—61——31

applied to this particular outbreak, although it does not necessarily eliminate the possibility of a biting insect.

As the Pacific campaign increased its tempo and the troops moved into the Philippines, the hepatitis rates which had declined after the end of the campaign in New Guinea and the Solomons again began to rise. At one time, the troops fighting on Luzon had a rate of 415 per 1,000 per annum.[55] In the Philippine Islands, combat troops of the Sixth U.S. Army suffered much more from infectious hepatitis than did service troops in the first quarter of 1945.

Meanwhile, in Western Pacific areas adjacent to SWPA, infectious hepatitis proved to be one of the leading causes of disability. In his report for 1945, the Chief Surgeon of this area stated that from an epidemiological standpoint there was considerable evidence that disease rates were high where there were breaks in environmental sanitation. On Angaur, Guam, Saipan, Tinian, and Iwo Jima, hepatitis occurred. It is of great interest, however, that the rate on Iwo Jima, despite the very heavy fighting on that island, was 0.4 per 1,000 per annum, very low indeed, and that this paralleled the very low incidence of the spread of infectious gastrointestinal disease on that island.[56]

The incidence on the island of Angaur increased sharply after the arrival of a heavy bombardment group which had become seriously infected on Leyte, illustrating an old observation that once troops have become infected and are moved into areas adjacent to previously uninfected troops the rate in the previously uninfected group tends to rise. Of passing interest is the report of 174 cases of the 27th Infantry Division on Espíritu Santo. All of these patients had been in combat on Saipan, and all of them gave a history of diarrhea. Of 142 patients more closely studied, 123 gave a history of a denguelike fever 24 to 32 days before onset of the hepatitis, which suggested to those on the scene the possibility that this might be a disease caused by a filterable virus of the denguelike group of viruses having a predeliction for the biliary tract. The close connection between the combat period on Saipan, the "dengue," and the diarrheas suggested to observers that this disease was not infectious hepatitis as they had thought of it before.[57]

In summary, infectious hepatitis rates in the Southwest Pacific Area gradually rose throughout the war, reaching in 1945 rates higher than those reported from any other theater of operations. The studies of Major Trussell and the report of Major Borland illustrate prevailing local opinions regarding its manner of spread. Trussell believed, and cited evidence to support his view, which is the prevailing belief today, that disease was spread by transmission of the agent through fecal contamination, either directly or by

---

[55] Annual Report, Chief Surgeon, General Headquarters, U.S. Army Forces, Pacific, 1945.

[56] Turner, Glenn O.: History of Internal Medicine of the Western Pacific Base Command. [Official record.]

[57] Essential Technical Medical Data, South Pacific Base Command, for October 1944, enclosure 2 thereto.

flies, food, or water. Borland, on the other hand, believed that some arthropod vector, possibly a small night-biting phlebotomus, might be responsible in certain instances, and he cited evidence which he admits is not wholly convincing but which lends weight to this possibility.

Infectious Hepatitis in the China-Burma-India Theater

The surgeon of the China-Burma-India theater was alerted by a cable from the Office of the Surgeon General on 30 May 1942 which warned of the possibility of serum hepatitis following yellow fever inoculation. Although the concentration of troops in India at that time was small and was limited largely to service troops, there had been seven cases among the members of the U.S. Military Mission to Burma who had walked out with Lt. Gen. (later General) Joseph W. Stilwell. The General himself developed jaundice on 3 June 1942.[58] He had received vaccine from lot number 334 on 2 February 1942. Aside from its human interest, this case is interesting in view of General Stilwell's subsequent death and the post mortem findings in the liver.

After the subsidence of the outbreak of cases due to yellow fever vaccine, an illness occurred sporadically, which, was, presumably, naturally acquired infectious hepatitis. The seasonal incidence of hepatitis here was the same as in the North African Theater of Operations; that is, it increased in the late summer, and the peak was reached in September and October. The sharpest outbreak occurred at the Chakulia Base, Bihar Province, India, in August 1944 when 122 cases were admitted to the station hospital from a relatively small number of troops.

Relation to other diseases.—Considering the very high rates of incidence of diarrhea and dysentery among the troops in the China-Burma-India theater and the sanitary conditions prevailing throughout most of the theater, the rates for hepatitis were not so high as might have been expected (table 54). In India and Burma the majority of U.S. troops were concentrated in areas adjacent to the great port cities of Bombay and Calcutta, or along the Burma road in Assam and north Burma, while in China the troops were chiefly air corps troops until after 1944, when ground troops were in Yünnan. In all these areas, despite vigilance and relatively good camp sanitation, the rates of diarrhea and dysentery, as well as of insect-borne diseases such as dengue, malaria, and scrub typhus, were all relatively high, yet the hepatitis rates showed no proportionate height save a possible correlation with rates of diarrhea and dysentery (chart 12).

The venereal disease rate was also high. This is of importance since syphilis throughout the war and gonorrhea after the introduction of penicillin were treated perenterally, and since the possibility exists that mechanical transfer by syringe is important in infectious hepatitis as well as in syringe

---

[58] Blumgart, H. L., and Pike, G. N.: History of Internal Medicine in the India-Burma Theater. [Official record.]

or serum hepatitis. However, there was no evident correlation of hepatitis rates with venereal disease rates.

TABLE 54.—*Infectious hepatitis in the China-Burma-India theater, by year, 1942–45*

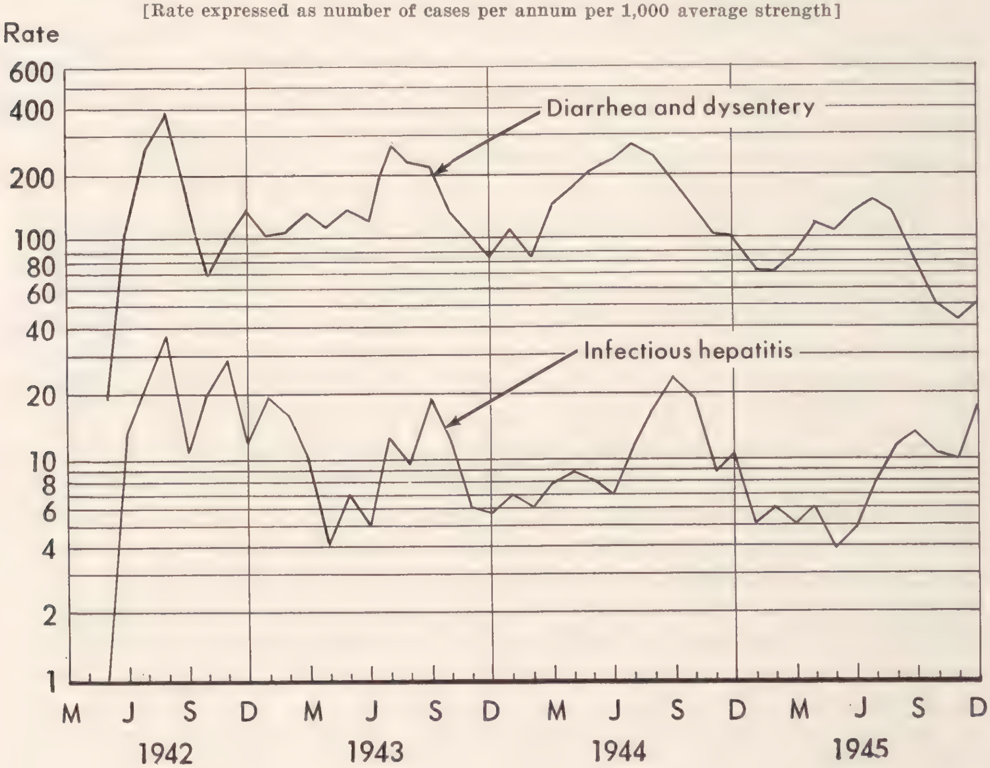
[Preliminary data based on tabulations of individual medical records and summaries of statistical health reports]

[Rate expressed as number of admissions per annum per 1,000 average strength]

Year	Admissions	
	Number	Rate
1942	135	15.44
1943	520	13.13
1944	1,681	9.96
1945	1,780	8.04
Total	4,116	9.39

CHART 12.—*Monthly incidence rates for infectious hepatitis and for diarrhea and dysentery, U.S. Army troops in China-Burma-India theater, March 1942 to December 1945*

[Rate expressed as number of cases per annum per 1,000 average strength]



The only study of any size carried out in CBI was that made by Ware, Hendricks, and Bren (cited by Blumgart and Pike) on the outbreak of serum hepatitis in 1942. They reported clinical findings on some 405 patients. The authors have been unable to find any other significant epidemiological or laboratory studies carried out in the China-Burma-India theater.

Infectious Hepatitis in Latin America

Whether one considers the overall incidence in Latin America, or that of its various subdivisions such as the Department of Antilles or the Department of Panama, it is apparent that except for the general rise due to yellow fever vaccine (serum) hepatitis in 1942, the rates for hepatitis were surprisingly low and compare favorably with those in the Zone of Interior (table 55). As in the China-Burma-India theater, diseases spread by way of the oral-intestinal route were common. The venereal diseases and malaria were also prevalent. Although clinical studies on infectious hepatitis were carried out in Army installations in these areas, no significant epidemiological or laboratory studies have been reported.

TABLE 55.—*Infectious hepatitis in the U.S. Army in Latin America, by year, 1942–45*

[Preliminary data based on tabulations of individual medical records and summaries of statistical health reports]

[Rate expressed as number of admissions per annum per 1,000 average strength]

Year	Admissions	
	Number	Rate
1942	863	8.47
1943	86	0.71
1944	207	2.41
1945	220	3.02
Total	1,376	3.61

SUMMARY AND EVALUATION OF EXPERIENCE

In considering the epidemiology of the naturally occurring infectious hepatitis in the largest tropical and semitropical theaters, it must be admitted that the knowledge gained during World War II was singularly sparse, in view of the magnitude of the problem, at least in regard to mode of spread. Moreover, the question as to why hepatitis became epidemic in troops only in certain geographical areas must be left unanswered.

Adequate proof exists that the disease may be transmitted by means of the oral-intestinal route and by the parenteral route to human volunteers. Nevertheless, a statistical comparison of the incidence of hepatitis in these theaters with the incidences of other diseases spread via the oral-intestinal and parenteral routes could raise some doubt that these routes are the sole or predominant means of spread in the hepatitis epidemics.

One might expect that, were the virus always spread in natural epidemics by the oral-intestinal route alone, the incidence of hepatitis in troops situated in areas where there was a high rate of diarrhea and dysentery might show some correlation with the relative incidence of diarrhea and other enteric diseases. As has been seen, in India, China, Burma, and the Southwest Pacific, as well as in Latin America, there was no particularly obvious correlation. On the other hand, if parenteral spread were an important factor, one might reasonably expect a correlation between the incidence of hepatitis and the rate of venereal disease since syphilis and gonorrhea were treated by parenteral medication; but, again, no such correlation is apparent. One may conclude that all is not yet known about the spread of hepatitis in military populations in different parts of the world.

In retrospect, it is apparent that viral hepatitis represented one of the most unexpected and most serious of the medical problems which confronted the U.S. Army in World War II. The most serious aspect of this problem was its numerical size; recognized cases numbered in the neighborhood of 200,000. This experience has established hepatitis in the minds of those who had to deal with the problem as a military disease of the first magnitude during World War II. Of great concern and great importance was the unexpected epidemic of serum hepatitis which occurred at the beginning of U.S. participation in the war. It represented the first large military epidemic of serum hepatitis ever to be recorded.

The research work on the hepatitides done under the auspices of the Medical Department of the U.S. Army by certain of the commissions of the Army Epidemiological Board, as well as by groups in the Medical Department, made a most important contribution to the knowledge of these diseases as well as to military history. In this report we have tried to record the epidemiological circumstances under which hepatitis occurred among the U.S. Armed Forces, and the information learned from these circumstances. Major contributions to knowledge were the identification of catarrhal jaundice with the viral hepatitides; the means for experimental study of these diseases; the indications that two varieties of viral hepatitis, infectious hepatitis and serum hepatitis, exist; information concerning the various ways in which each form of the virus can be transmitted; the clinical pictures and the revelation of the tendency in a few cases to chronicity and to relapse and of the circumstances under which the disease occurred most frequently. Although it cannot be said that World War II experiences resulted in a satisfactory method of preventing hepatitis or in a satisfactory method of therapy, much new information was accumulated about these diseases, and the difference between the knowledge of the disease in 1942 and that in 1946 is, to say the least, extraordinary. Credit for a large part of this achievement can rightfully be assigned to the Preventive Medicine Service, Office of the Surgeon General, and to the Army Epidemiological Board.

APPENDIX A

Headquarters

The Replacement and Training Command, MTOUSA

AG 710 (RCSUR) 9 April 1945

SUBJECT: Scabies

TO: Commanders Concerned

1. It has been noted that there is an increased prevalence of scabies in organizations of this command. Every effort will be made to reduce the incidence to a minimum.

2. The following is given for your information and guidance:

a. Scabies is a contagious itchy disease of the skin caused by a microscopic parasite. It burrows in the skin, lays eggs in the burrows, which gives rise to new generation of "mites." Reinfection from one's own person or bedding, tends to make the disease chronic.

b. A survey made in this command shows that scabies is being contracted in the following ways:

(1) Sexual intercourse.

(2) Using infested civilian beds or blankets.

(3) The temporary use of an unsterilized, infested sleeping bag for an overnight problem.

(4) Use of a common bunk by guards during off duty hours.

(5) Casual contact with an infected, untreated tent mate.

3. The following corrective measures will be provided:

a. Adequate bathing schedules.

b. Adequate washing or sterilization of clothing and blankets of infected individuals. (Disinfectors, trailer type, #9924650, are reported in stock and may be procured through usual supply channels by units with a mean strength above 2,000).

c. All cases will be treated in conformity with instructions listed in Inclosure Number 1.

d. Each patient will be supplied with the mimeographed information listed in Inclosure Number 2. (To be reproduced locally.)

TREATMENT

1. On the day of diagnosis the soldier may return to duty after being given the mimeographed instructions attached as Inclosure Number 2.

2. He should report for the first application of 10 to 20 percent sulphur ointment between 1630 hours to 1800 hours. This should be applied thoroughly and rubbed in over a period of fifteen (15) minutes from neck to feet with special attention to itchy areas. One soldier may anoint another's back. The entire treatment will be supervised. The application of ointment will be made in the battalion dispensary.

3. He should repeat the above application before bed time and sleep in clean bedding. In this way, the soldier is completely anointed for a period of at least twelve (12) hours, the objective being to kill all live mites.

4. The ointment should be made available in a large container. Tubes of sulphur ointment are inadequate and wasteful for this purpose, although they may be used as an adjunct to therapy when cure is almost complete or when soldier is alerted.

5. The following morning the soldier should shower (to cut down incidence of sulphur dermatitis), change to clean clothing and report to duty.

6. The entire process described in paragraphs 2 and 3 should be repeated in one (1) week to kill off second generation mites (Eggs hatch in four (4) to five (5) days). The soldier should be reexamined at the end of two (2) weeks.

7. If the case becomes chronic, inquiry should be directed towards the possible source of reinfection, which most likely will be a prostitute, civilian bed, the soldier's own bedding, or clothing.

8. All cases will be reported as part of the monthly sanitary report.

INFORMATION FOR THE SOLDIER

You have scabies, caused by a tiny louse-like "mite," so small that it can be seen only with a microscope. It gets in the skin and burrows when you are warm—hence the itching.

The eggs develop in four (4) or five (5) days so you will need at least one more treatment in a week. Even the dead mite may continue to itch so itching is not necessarily a sign that you are not getting cured. The appearance of new itchy bumps on the wrists, arms, legs, or penis after you have had two treatments may mean that you have still got them. Check up with the dispensary. Are you going back to the same girl? Did you wash or sterilize your clothes, bedding or sleeping bag? Don't sit on a tent mate's bed until you are cured.

Before reporting for treatment, lather yourself all over with soap; scrubbing the skin, especially itchy parts, thoroughly for twenty (20) minutes and follow with a shower. In this way you clean the skin of parasites and get the burrow soft and open.

GIVE THIS TO YOUR COMPANY COMMANDER.

APO______
U.S. Army

____
(Date)

SUBJECT: Scabies.
TO: Commanding Officer, ______ Replacement Company

1. ____________________ is scheduled for treatment today at ____ hours and again at ____ hours. He will shower before his first treatment.

2. His underclothing and OD's should be washed tomorrow; his blankets exchanged for washing or sterilization today.

3. Tomorrow morning he must shower by soaping and scrubbing thoroughly and then change to fresh, clean clothing. He will not sleep in his old blankets until sterilized.

4. Showers are to be taken daily for three (3) days.

5. He is to report to this dispensary for a check-up one (1) week from today, or if alerted, before leaving camp.

____
____
____

APPENDIX B

The Interdepartmental Agreement

An Agreement by the War and Navy Departments, the Federal Security Agency, and State Health Departments on Measures for the Control of the Venereal Diseases in Areas Where Armed Forces or National Defense Employees are Concentrated

It is recognized that the following services should be developed by State and local health and police authorities in cooperation with the Medical Corps of the United States Army, the Bureau of Medicine and Surgery of the United States Navy, the United States Public Health Service, and interested voluntary organizations:

1. Early diagnosis and adequate treatment by the Army and the Navy of enlisted personnel infected with the venereal diseases.

2. Early diagnosis and treatment of the civilian population by the local health department.

3. When authentic information can be obtained as to the probable source of venereal disease infection of military or naval personnel [familial contacts with naval patients will not be reported], the facts will be reported by medical officers of the Army or Navy to the State or local health authorities as may be required. If additional authentic information is available as to extramarital contacts with diseased military or naval personnel during the communicable stage, this should also be reported.

4. All contacts of enlisted men with infected civilians to be reported to the medical officers in charge of the Army and Navy by the local or State health authorities.

5. Recalcitrant infected persons with communicable syphilis or gonorrhea to be forcibly isolated during the period of communicability; in civilian populations, it is the duty of the local health authorities to obtain the assistance of the local police authorities in enforcing such isolation.

6. Decrease as far as possible the opportunities for contacts with infected persons. The local police department is responsible for the repression of commercialized and clandestine prostitution. The local health departments, the State Health Department, the Public Health Service, the Army, and the Navy will cooperate with the local police authorities in repressing prostitution.

7. An aggressive program of education both among enlisted personnel and the civilian population regarding the dangers of the venereal diseases, the methods for preventing these infections, and the steps which should be taken if a person suspects that he is infected.

8. The local police and health authorities, the State Department of Health, the Public Health Service, the Army, and the Navy desire the assistance of representatives of the American Social Hygiene Association or affiliated social hygiene societies or other voluntary welfare organizations or groups in developing and stimulating public support for the above measures.

559625v—61——32

APPENDIX C

[Public Law 163—77th Congress]
[Chapter 287—1st Session]
[H.R. 2475]

AN ACT

To prohibit prostitution within such reasonable distance of military and/or naval establishments as the Secretaries of War and/or Navy shall determine to be needful to the efficiency, health, and welfare of the Army and/or Navy.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That until May 15, 1945, it shall be unlawful, within such reasonable distance of any military or naval camp, station, fort, post, yard, base, cantonment, training or mobilization place as the Secretaries of War and/or Navy shall determine to be needful to the efficiency, health, and welfare of the Army and/or Navy, and shall designate and publish in general orders or bulletins, to engage in prostitution or to aid or abet prostitution or to procure or solicit for the purposes of prostitution, or to keep or set up a house of ill fame, brothel, or bawdy house, or to receive any person for purposes of lewdness, assignation, or prostitution into any vehicle, conveyance, place, structure, or building, or to permit any person to remain for the purpose of lewdness, assignation, or prostitution in any vehicle, conveyance, place, structure, or building or to lease, or rent, or contract to lease or rent any vehicle, conveyance, place, structure, or building, or part thereof, knowing or with good reason to know that it is intended to be used for any of the purposes herein prohibited; and any person, corporation, partnership, or association violating the provisions of this Act shall, unless otherwise punishable under the Articles of War or the Articles for the Government of the Navy, be deemed guilty of a misdemeanor and be punished by a fine of not more than $1,000, or by imprisonment for not more than one year, or by both such fine and imprisonment, and any person subject to military or naval law violating this Act shall be punished as provided by the Articles of War or the Articles for the Government of the Navy, and the Secretaries of War and of the Navy and the Federal Security Administrator are each hereby authorized and directed to take such steps as they deem necessary to suppress and prevent the violation thereof, and to accept the cooperation of the authorities of States and their counties, districts, and other political subdivisions in carrying out the purposes of this Act: *Provided,* That nothing in this Act shall be construed as conferring on the personnel of the War or Navy Department or the Federal Security Agency any authority to make criminal investigations, searches, seizures, or arrests of civilians charged with violations of this Act.

Approved, July 11, 1941.

APPENDIX D

A Summary of Venereal Disease Statistics During World War II

The methods of reporting venereal disease before and during the first part of World War II made it extremely difficult to determine true incidence rates. In the first place, many men were inducted into the Army who either had an undiagnosed infection or who developed the symptoms of a venereal disease very soon after induction. In these instances, the case was reported at time of diagnosis and charged against the Army rate. Secondly, there were many patients with chronic cases of venereal disease who were transferred from one Army hospital to another, and many of these patients were reported numerous times as representing new venereal infection. Beginning on 1 November 1942, infections acquired by soldiers before induction were not charged against the overall Army rate. Other measures were taken to prevent repeated reporting of the same case, and from this date on the actual rate per thousand men per year is believed to be fairly accurate. In addition, the statistical branch of the Venereal Disease Control Division prepared weekly and monthly statistical tables showing infection rates from venereal diseases, rates for noneffectiveness due to venereal diseases, and days lost per case of venereal disease, broken down by various service commands, theaters of operations, and so forth. This service was essential to the effective operation of the office and was continued throughout the war under the direction of Capt. Stanley Brooks Russell, MAC.

Under each of the various parts of chapter X, reference was made to certain statistics such as incidence rates, rates for noneffectiveness, and so forth, as they pertained to the material being discussed. It must be emphasized that these statistics were often tentative and based on whatever records were available during the war. Obviously, such data cannot be considered to be more than suggestive and were used primarily to indicate trends. They have been checked, whenever possible, by the Medical Statistics Division, Office of the Surgeon General, and have been revised, when necessary, to reflect the latest and most complete information available. Parts I and III of chapter X were reviewed to reflect data available as of December 1954. The data in parts II, IV, and V and in this appendix were checked in view of all information which had been gathered, analyzed, and summarized as of December 1956. In the latter instance, statistics compiled as a result of summarizing statistical health reports from the various commands were substituted for the less accurate statistics presented in other reports from these commands during the war.

The extent of error which will exist in the final statistics probably will never be known. It was recognized that many cases of venereal diseases were never diagnosed as such. It was also known that other cases were deliberately concealed and never carded for record, particularly during the period when punitive measures were in effect. No reliable studies were ever done to determine the actual extent of concealed cases, but various authorities have suggested that as much as 30 percent of venereal disease occurring in the U.S. Army in the continental United States was never known to the Army. The soldiers concerned obtained treatment through outside sources and, unless complications developed, were frequently able successfully to conceal their infection despite scheduled and unscheduled physical inspections.

It was doubted that the extremely low venereal disease rates for officers reflected the true situation because it was even less of a problem for officers to obtain outside

treatment or, in some instances, to be treated clandestinely at Army medical installations without being carded for record.

In order that some comprehensive estimate of venereal disease incidence and morbidity might be available in this volume, the tables which follow were prepared by the Medical Statistics Division, Office of the Surgeon General. In summary, it can be stated very simply that the lowest venereal disease rates in the U.S. Army occurred during 1943 and that the rates began to rise in 1944, further increased in 1945, and showed marked increases after the cessation of hostilities. The most striking factor, however, was that during this same period rates for noneffectiveness because of venereal disease, which had been very high in 1941 and 1942, dropped to new record lows by the end of the war in spite of increased incidence of the diseases. This decrease in noneffectiveness undoubtedly reflected the tremendous advances in treatment made during the war which are described in chapter X of this volume and also in another volume of the history of the Medical Department in World War II.[1]

The following 18 tables show statistical data on venereal diseases during the period 1941 through 1945 by geographic distribution and specific diagnosis. Diseases shown include gonorrhea, neurosyphilis, other syphilis, chancroid, lymphogranuloma venereum, and granuloma inguinale. The samples used to obtain tabulations of admission data, incidence data, or both were as follows: For 1942, 100 percent; for 1943, 20 percent in the United States and 100 percent in oversea areas; for 1944, 20 percent in Europe and 80 percent in other areas; and, for 1945, a 20 percent worldwide sample. Appendix table 9, which shows comparative rates of Negro troops versus non-Negro troops, varied from the cited sampling in that only 18 percent of individual medical records were used to obtain the 1944 statistics. Moreover, appendix table 8, which presents statistics on deaths due to venereal disease, was compiled from a review of all deaths recorded in the Army during the period.

Incidence (total cases) includes not only those cases in which the specified diagnosis was the primary cause of admission to medical treatment but also those cases for which the disease existed concurrently with another admission diagnosis or those cases which developed after admission to treatment. The data include cases contracted before Army service and, unless stated otherwise, CRO (carded for record only) cases; that is, patients treated on an outpatient basis without loss of time from duty. Tabulations of cases contracted before Army service were, however, available only for 1945; for this one year, 2 percent of the gonorrhea cases, 48 percent of the neurosyphilis cases, and 25 percent of the other syphilis cases were reported as having been contracted before Army service.

In appendix tables 4, 5, and 6, the loss to the Army in manpower as a result of venereal diseases is summarized. Average duration means the average time lost per admission, while rates for noneffectiveness reflect the average number of patients in hospitals or sick in quarters per 1,000 average strength. Admissions for venereal diseases and data on average duration, it is to be noted, are separately shown in appendix table 6 for 1945 to exclude and include CRO cases. Obviously, those cases carded for record only must be differentiated in that they do not contribute to the noneffectiveness shown in appendix tables 4 and 5.

Concerning the rate for noneffectiveness, it is worthy of note that in the years immediately preceding World War II venereal disease was one of the major causes of noneffectiveness at a daily rate of about 3.5 per 1,000 troops. This daily rate represented approximately one-half of the noneffectiveness caused by all infectious and parasitic diseases. By the last year of the war, the rate for noneffectiveness because of

[1] Medical Department, United States Army. Internal Medicine in World War II. Volume II. Infectious Diseases. [In preparation.]

venereal disease had dropped to about 1 per 1,000 troops, or approximately one-fifth of the noneffectiveness caused by all infectious and parasitic diseases.

Aforementioned appendix table 9 includes pooled data for both officers and enlisted men and reveals that venereal disease prevailed to an appreciably greater extent among Negro troops. Even though officers are confined mainly to the non-Negro category and show lower rates, according to the data for 1942 (the only year for which this type of data are available), the exclusion of officers would have had only a slight influence on the relative annual rates per one thousand average strength of the racial dichotomy. The rates per one thousand average strength for all venereal diseases, with and without officer cases, for 1942, follow:

	Rate
Enlisted men only:	
Negroes	261.64
Non-Negro personnel	27.43
Total	43.30
Officers and enlisted men:	
Negroes	259.95
Non-Negro personnel	25.64
Total	40.36

Finally, the data presented in chapter X for the years 1942 through 1945 must be considered preliminary pending completion of final tabulations of individual medical records.

Appendix Table 1.—*Incidence of venereal diseases in the U.S. Army, by diagnosis and area, 1941*

[Rate expressed as number of cases per annum per 1,000 average strength]

Diagnosis	Total Army		United States [1]		Overseas [2]							
					Total overseas		Hawaii		Panama		Philippine Islands	
	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate
Gonorrhea	37,645	28.03	34,115	29.94	3,482	29.51	489	13.04	1,108	36.84	667	67.50
Neurosyphilis	262	.20	227	.20	32	.27	9	.24	15	.50	2	.20
Syphilis, other	8,239	6.13	7,181	6.30	1,021	8.65	96	2.56	208	6.92	189	19.13
Chancroid	4,679	3.48	2,902	2.55	1,774	15.03	37	.99	855	28.43	420	42.50
Lymphogranuloma venereum	768	.57	626	.55	142	1.20	2	.05	59	1.96	33	3.34
Granuloma inguinale	16	.01	16	.01	--------	0	--------	0	--------	0	--------	0

Diagnosis	Overseas [2]—Continued									
	Puerto Rico		Other areas		Transports		Native troops [3]			
							Filipinos		Puerto Ricans	
	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate
Gonorrhea	354	55.52	284	38.01	95	27.28	46	4.09	439	36.64
Neurosyphilis	1	.16	--------	0	--------	0	2	.18	3	.25
Syphilis, other	205	32.15	48	6.42	13	3.73	14	1.24	248	20.70
Chancroid	180	28.23	111	14.86	9	2.58	10	.89	152	12.68
Lymphogranuloma venereum	14	2.20	8	1.07	1	.29	2	.18	23	1.92
Granuloma inguinale	--------	0	--------	0	--------	0	--------	0	--------	0

[1] Enlisted men only; includes Alaska.
[2] White enlisted men and native troops only.
[3] Native troops have not been distributed by geographic locations.

Source: Annual Report, Surgeon General of the Army, 1941.

APPENDIX TABLE 2.—*Incidence (total cases) of venereal diseases in the U.S. Army, by diagnosis, broad geographic area, and year, 1942–45*

[Preliminary data based on sample tabulations of individual medical records]

[Rate expressed as number of cases per annum per 1,000 average strength]

Diagnosis	1942–45		1942		1943		1944		1945	
	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate
	CONTINENTAL UNITED STATES									
Gonorrhea	464, 962	31. 52	83, 540	31. 44	123, 920	23. 91	130, 652	32. 87	126, 670	43. 21
Neurosyphilis	7, 499	. 51	825	. 31	4, 015	. 77	1, 744	. 44	865	. 30
Syphilis, other	222, 906	15. 12	18, 284	6. 88	87, 895	16. 96	77, 827	19. 60	38, 900	13. 27
Chancroid	21, 085	1. 43	6, 465	2. 43	8, 190	1. 58	3, 680	. 93	2, 750	. 94
Lymphogranuloma venereum	9, 374	. 64	1, 730	. 65	3, 080	. 59	2, 624	. 66	1, 940	. 66
Granuloma inguinale	623	. 04	61	. 02	100	. 02	287	. 07	175	. 06
	OVERSEAS									
Gonorrhea	416, 694	38. 81	12, 038	20. 55	33, 843	20. 05	112, 063	29. 34	258, 750	55. 72
Neurosyphilis	2, 290	. 21	86	. 15	296	. 18	1, 018	. 27	890	. 19
Syphilis, other	95, 474	8. 89	3, 652	6. 23	10, 369	6. 14	31, 678	8. 29	49, 775	10. 72
Chancroid	78, 276	7. 29	4, 114	7. 02	12, 235	7. 25	24, 577	6. 44	37, 350	8. 04
Lymphogranuloma venereum	5, 625	. 52	304	. 52	749	. 44	1, 342	. 35	3, 230	. 70
Granuloma inguinale	260	. 02	4	. 01	11	. 01	75	. 02	170	. 04
	TOTAL ARMY									
Gonorrhea	881, 386	34. 59	95, 578	29. 47	157, 763	22. 96	242, 625	31. 14	385, 420	50. 88
Neurosyphilis	9, 739	. 38	911	. 28	4, 311	. 63	2, 762	. 35	1, 755	. 23
Syphilis, other	318, 380	12. 50	21, 936	6. 76	98, 264	14. 30	109, 505	14. 06	88, 675	11. 71
Chancroid	99, 361	3. 90	10, 579	3. 26	20, 425	2. 97	28, 257	3. 63	40, 100	5. 29
Lymphogranuloma venereum	14, 999	. 59	2, 034	. 62	3, 829	. 56	3, 966	. 51	5, 170	. 68
Granuloma inguinale	883	. 03	65	. 02	111	. 02	362	. 05	345	. 05

Appendix Table 3.—*Incidence (total cases) of venereal diseases in the U.S. Army, by diagnosis, theater or area, and year, 1942–45*

[Preliminary data based on sample tabulations of individual medical records]

[Rate expressed as number of cases per annum per 1,000 average strength]

Theater or area	1942–45		1942		1943		1944		1945	
	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate
	GONORRHEA									
Continental United States	464, 692	31. 52	83, 540	31. 44	123, 920	23. 91	130, 562	32. 87	126, 670	43. 21
Overseas:										
Europe	220, 336	50. 09	2, 218	26. 72	6, 423	24. 07	41, 575	24. 79	170, 120	71. 71
Mediterranean [1]	98, 512	66. 42	724	31. 58	15, 560	34. 07	51, 443	79. 20	30, 785	87. 00
Middle East	3, 981	27. 23	224	37. 05	1, 287	24. 26	1, 370	29. 64	1, 100	26. 90
China-Burma-India	9, 087	20. 72	317	36. 25	985	24. 86	3, 295	19. 53	4, 490	20. 28
Southwest Pacific	44, 344	24. 15	1, 830	25. 69	2, 184	11. 50	4, 100	7. 60	36, 230	34. 97
Central and South Pacific	13, 658	10. 87	1, 120	7. 42	1, 247	4. 28	2, 571	5. 86	8, 720	23. 21
North America [2]	3, 614	7. 34	706	7. 02	1, 053	5. 41	1, 145	8. 86	710	10. 43
Latin America	13, 441	35. 24	4, 383	43. 00	4, 218	34. 91	3, 290	38. 35	1, 550	21. 28
Total overseas [3]	416, 694	38. 81	12, 038	20. 55	33, 843	20. 05	112, 063	29. 34	258, 750	55. 72
Total Army	881, 386	34. 59	95, 578	29. 47	157, 763	22. 96	242, 625	31. 14	385, 420	50. 88
	NEUROSYPHILIS									
Continental United States	7, 449	0. 51	825	0. 31	4, 015	0. 77	1, 744	0. 44	865	0. 30
Overseas:										
Europe	872	. 20	9	. 11	33	. 12	405	. 24	425	. 18
Mediterranean [1]	263	. 18	2	. 09	50	. 11	126	. 19	85	. 24
Middle East	56	. 38	2	. 33	24	. 45	20	. 43	10	. 24
China-Burma-India	168	. 38	----------	------	7	. 18	106	. 63	55	. 25
Southwest Pacific	371	. 20	20	. 28	59	. 31	122	. 23	170	. 16
Central and South Pacific	309	. 25	25	. 17	54	. 19	125	. 28	105	. 28
North America [2]	110	. 22	9	. 09	26	. 13	55	. 43	20	. 29
Latin America	129	. 34	18	. 18	42	. 35	49	. 57	20	. 27
Total overseas [3]	2, 290	. 21	86	. 15	296	. 18	1, 018	. 27	890	. 19
Total Army	9, 739	. 38	911	. 28	4, 311	. 63	2, 762	. 35	1, 755	. 23

See footnotes at end of table.

APPENDIX TABLE 3.—*Incidence (total cases) of venereal diseases in the U.S. Army, by diagnosis, theater or area, and year, 1942–45*—Continued

[Preliminary data based on sample tabulations of individual medical records]

[Rate expressed as number of cases per annum per 1,000 average strength]

Theater or area	1942–45		1942		1943		1944		1945	
	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate
	SYPHILIS, OTHER									
Continental United States	222,906	15.12	18,284	6.88	87,895	16.96	77,827	19.60	38,900	13.27
Overseas:										
Europe	43,307	9.84	619	7.46	2,468	9.25	11,395	6.79	28,825	12.15
Mediterranean [1]	22,574	15.22	177	7.72	3,560	7.79	11,457	17.64	7,380	20.86
Middle East	1,971	13.48	61	10.09	731	13.78	789	17.07	390	9.54
China-Burma-India	5,828	13.29	65	7.43	576	14.54	2,697	15.99	2,490	11.25
Southwest Pacific	9,020	4.91	352	4.94	562	2.96	2,116	3.92	5,990	5.78
Central and South Pacific	4,572	3.64	361	2.39	388	1.33	1,568	3.57	2,255	6.00
North America [2]	989	2.01	151	1.50	271	1.39	297	2.30	270	3.97
Latin America	5,507	14.44	1,803	17.69	1,714	14.18	1,175	13.69	815	11.19
Total overseas [3]	95,474	8.89	3,652	6.23	10,369	6.14	31,678	8.29	49,775	10.72
Total Army	318,380	12.50	21,936	6.76	98,264	14.30	109,505	14.06	88,675	11.71
	CHANCROID									
Continental United States	21,084	1.43	6,465	2.43	8,190	1.58	3,680	0.93	2,750	0.94
Overseas:										
Europe	17,062	3.88	133	1.60	584	2.19	2,760	1.65	13,580	5.72
Mediterranean [1]	32,991	22.25	299	13.04	8,076	17.68	18,616	28.66	6,000	16.96
Middle East	2,838	19.41	141	23.32	1,331	25.09	846	18.30	520	12.72
China-Burma-India	4,557	10.39	246	28.13	616	15.55	1,955	11.59	1,740	7.86
Southwest Pacific	13,190	7.18	71	1.00	78	.41	96	.18	12,945	12.49
Central and South Pacific	2,406	1.91	115	.76	36	.12	85	.19	2,170	5.78
North America [2]	84	.17	28	.28	33	.17	8	.06	15	.22
Latin America	4,650	12.19	3,007	29.50	1,358	11.24	155	1.81	130	1.78
Total overseas [3]	78,270	7.29	4,114	7.02	12,235	7.25	24,577	6.44	37,350	8.04
Total Army	99,361	3.90	10,579	3.26	20,425	2.97	28,257	3.63	40,100	5.29

See footnotes at end of table.

APPENDIX TABLE 3.—*Incidence (total cases) of venereal diseases in the U.S. Army, by diagnosis, theater or area, and year, 1942–45*—Continued

[Preliminary data based on sample tabulations of individual medical records]

[Rate expressed as number of cases per annum per 1,000 average strength]

Theater or area	1942–45		1942		1943		1944		1945	
	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate
	LYMPHOGRANULOMA VENEREUM									
Continental United States	9,374	0.64	1,730	0.65	3,080	0.69	2,624	0.66	1,940	0.66
Overseas:										
Europe	1,333	.30	19	.23	84	.31	320	.19	910	.38
Mediterranean [1]	653	.44	5	.22	200	.44	318	.49	130	.37
Middle East	283	1.94	22	3.64	87	1.64	109	2.36	65	1.59
China-Burma-India	1,096	2.50	27	3.09	91	2.30	338	2.00	640	2.89
Southwest Pacific	1,071	.58	10	.14	10	.05	36	.07	1,015	.98
Central and South Pacific	415	.33	11	.07	29	.10	75	.17	300	.80
North America [2]	27	.05	2	.02	10	.05	10	.08	5	.07
Latin America	609	1.60	197	1.93	233	1.93	119	1.39	60	.82
Total overseas [3]	5,625	.52	304	.52	749	.44	1,342	.35	3,230	.70
Total Army	14,999	.59	2,034	.62	3,829	.56	3,966	.51	5,170	.68
	GRANULOMA INGUINALE									
Continental United States	623	0.04	61	0.02	100	0.02	287	0.07	175	0.06
Overseas:										
Europe	111	.03	1	.01	----------	------	30	.02	80	.03
Mediterranean [1]	43	.03	----------	------	1	.00	17	.03	25	.07
Middle East	1	.01	----------	------	----------	------	1	.02	----------	------
China-Burma-India	34	.08	----------	------	3	.08	6	.04	25	.11
Southwest Pacific	20	.01	----------	------	1	.01	4	.01	15	.01
Central and South Pacific	42	.03	----------	------	1	.00	16	.04	25	.07
North America [2]	3	.01	2	.02	1	.01	----------	------	----------	------
Latin America	5	.01	1	.01	3	.02	1	.01	----------	------
Total overseas [3]	260	.02	4	.01	11	.01	75	.02	170	.04
Total Army	883	.03	65	.02	111	.02	362	.05	345	.05

[1] Includes North Africa.
[2] Includes Alaska and Iceland.
[3] Includes cases on transports.

Appendix Table 4.—*Noneffectiveness caused by venereal diseases in the U.S. Army, by diagnosis, 1941*

[Preliminary data based on sample tabulations of individual medical records]

[Rate expressed as average number of noneffectives per 1,000 average strength]

Diagnosis	Total days lost [1]	Average duration [2]	Rate
Gonorrhea	842, 738	22. 4	1. 72
Neurosyphilis	24, 484	92. 4	. 05
Syphilis, other	184, 718	22. 4	. 38
Chancroid	77, 635	16. 6	. 16
Lymphogranuloma venereum	18, 692	24. 3	. 04
Granuloma inguinale	434	27. 1	. 00

[1] Total days lost during the calendar year.
[2] Based on days lost and incidence (total cases) during the calendar year.

Appendix Table 5.—*Noneffectiveness caused by venereal diseases in the U.S. Army, by diagnosis, 1942*

[Preliminary data based on sample tabulations of individual medical records]

[Rate expressed as average number of noneffectives per 1,000 average strength]

Diagnosis	Total days lost [1]	Average duration [2]	Rate
Gonorrhea	1, 859, 910	19. 5	1. 48
Neurosyphilis	66, 230	72. 7	. 04
Syphilis, other	453, 840	20. 7	. 38
Chancroid	172, 140	16. 3	. 14
Lymphogranuloma venereum	45, 480	22. 4	. 04
Granuloma inguinale	2, 500	38. 5	. 00

[1] Total days lost for all 1942 admissions.
[2] Average number of days lost per 1942 admission.

APPENDIX TABLE 6.—*Average duration for venereal diseases, with and without cases carded for record only (no time lost) in the U.S. Army, 1945*

[Preliminary data based on sample tabulations of individual medical records]

Admissions [1] and average duration	Gonorrhea	Neuro-syphilis	Syphilis, other	Chancroid	Lympho-granuloma venereum	Granuloma inguinale
United States:						
Admissions:						
Including CRO	122, 780	705	32, 385	2, 340	1, 800	130
Excluding CRO	31, 135	695	24, 380	2, 280	1, 765	130
Total days lost	237, 335	89, 425	412, 805	36, 025	41, 980	6, 970
Average duration (days):						
Including CRO	1. 9	126. 8	12. 7	15. 4	23. 3	53. 6
Excluding CRO	7. 6	128. 7	16. 9	15. 8	23. 8	53. 6
Overseas:						
Admissions:						
Including CRO	271, 115	665	42, 205	35, 005	2, 685	120
Excluding CRO	120, 500	660	41, 995	33, 670	2, 665	120
Total days lost	723, 185	85, 494	781, 490	417, 230	62, 420	7, 330
Average duration (days):						
Including CRO	2. 7	128. 6	18. 5	11. 9	23. 2	61. 1
Excluding CRO	6. 0	129. 5	18. 6	12. 4	23. 4	61. 1
Total Army:						
Admissions:						
Including CRO	393, 895	1, 370	74, 590	37, 345	4, 485	250
Excluding CRO	151, 635	1, 355	66, 375	35, 950	4, 430	250
Total days lost	960, 520	174, 920	1, 194, 295	453, 255	104, 400	14, 300
Average duration (days):						
Including CRO	2. 4	127. 7	16. 0	12. 1	23. 3	57. 2
Excluding CRO	6. 3	129. 1	18. 0	12. 6	23. 6	57. 2

[1] Admissions with known days lost.

APPENDIX TABLE 7.—*Cases of venereal diseases in the U.S. Army, by diagnosis, 1944–45*

[Preliminary data based on sample tabulations of individual medical record primary and secondary diagnoses]

[Rate expressed as number of cases per annum per 1,000 average strength]

Diagnosis	Total Army				United States				Overseas			
	1944		1945		1944		1945		1944		1945	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Gonorrhea	242, 625	31. 14	412, 185	54. 41	130, 562	32. 87	128, 720	43. 91	112, 063	29. 34	283, 465	61. 05
Neurosyphilis	2, 762	. 35	1, 755	. 23	1, 744	. 44	865	. 30	1, 018	. 27	890	. 19
Syphilis, other	109, 504	14. 06	86, 775	11. 46	77, 826	19. 59	37, 605	12. 83	31, 678	8. 29	49, 170	10. 59
Chancroid	28, 250	3. 63	40, 835	5. 39	3, 679	. 93	2, 780	. 95	24, 571	6. 43	38, 055	8. 20
Lymphogranuloma venereum	3, 966	. 51	5, 345	. 71	2, 624	. 66	2, 030	. 69	1, 342	. 35	3, 315	. 71
Granuloma inguinale	362	. 05	355	. 05	287	. 07	185	. 06	75	. 02	170	. 04

APPENDIX TABLE 8.—*Deaths due to venereal diseases in the U.S. Army, by diagnosis and year, 1941–45* [1]

[Years 1942–45 based on preliminary tabulations of individual medical records]

[Rate expressed as number per annum per 1,000 average strength]

Year and area	Gonorrhea		Neurosyphilis		Syphilis, other		Chancroid	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
1941								
United States [2]	5	0.44	4	0.35	11	0.97		0
Overseas [3]		0		0		0		0
Total	5	.37	4	.30	12	.89		0
1942								
United States	6	.23	3	.11	10	.38		0
Overseas		0	1	.17	1	.17		0
Total	6	.19	4	.12	11	.34		0
1943								
United States	14	.12	5	.10	14	.27		0
Overseas	2	.27	1	.06	2	.12		0
Total	16	.23	6	.09	16	.23		0
1944								
United States		0	6	.15	7	.18		0
Overseas	2	.05	1	.03	3	.08		0
Total	2	.03	7	.09	10	.13		0
1945								
United States		0	4	.14	3	.10		0
Overseas		0	3	.06	6	.13	1	.02
Total		0	7	.09	9	.12	1	.01

[1] No deaths due to granuloma inguinale or lymphogranuloma venereum during 1941–45.
[2] Enlisted men only; includes Alaska.
[3] White enlisted men and native troops only.

APPENDIX TABLE 9.—*Incidence of venereal diseases in the U.S. Army, by diagnosis and race, 1942–44*

[Preliminary data based on sample tabulations of individual medical records]

[Rate expressed as number of cases per annum per 1,000 average strength]

Diagnosis	Total Army		Non-Negro personnel		Negroes	
	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate
Gonorrhea	495,966	27.70	324,958	19.71	171,008	121.07
Neurosyphilis	7,984	.45	5,795	.35	2,189	1.55
Syphilis, other	229,705	12.83	96,046	5.82	133,659	94.63
Chancroid	59,261	3.31	28,632	1.74	30,629	21.69
Lymphogranuloma venereum	9,829	.55	1,826	.11	8,003	5.67
Granuloma inguinale	538	.03	59	.00	479	.34
Total	803,283	44.87	456,316	27.73	345,967	244.95

Appendix Table 10.—*Incidence (total cases) of gonorrhea in the U.S. Army, by theater or area and month, 1942*

[Preliminary data based on sample tabulations of individual medical records]

[Rate expressed as number of cases per annum per 1,000 average strength]

Theater or area	Total		January		February		March		April	
	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate
Continental United States	83,540	31.44	4,730	35.15	4,671	34.67	4,396	26.78	4,732	27.37
Overseas:										
Europe	2,218	26.72	1	15.15	5	16.29	5	5.71	8	8.54
Mediterranean [1]	724	31.58								
Middle East [2]	224	37.05								
China-Burma-India [3]	317	36.25					4	15.09	7	24.22
Southwest Pacific	1,830	25.69	6	19.17	25	45.45	58	34.16	133	32.43
Central and South Pacific	1,120	7.42	31	6.70	32	6.79	59	9.57	69	7.35
North America	706	7.02	49	15.85	28	8.64	25	5.55	44	8.29
Latin America	4,383	43.00	277	45.51	294	47.18	322	43.51	282	33.50
Total overseas [4]	12,038	20.55	393	24.69	411	22.01	520	20.62	580	17.72
Total Army	95,578	29.47	5,123	34.04	5,082	33.13	4,916	25.96	5,312	25.84

Theater or area	May		June		July		August	
	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate
Continental United States	5,064	26.52	4,834	24.32	6,313	29.30	7,398	31.69
Overseas:								
Europe	28	14.52	55	15.04	100	17.34	263	25.98
Mediterranean [1]								
Middle East [2]			2	44.44	8	25.40	14	30.04
China-Burma-India [3]	11	20.11	16	28.32	12	17.14	42	45.75
Southwest Pacific	172	28.92	225	32.59	258	33.67	245	29.16
Central and South Pacific	104	9.17	115	9.02	125	8.59	155	10.12
North America	42	6.31	48	6.21	78	7.98	73	6.78
Latin America	339	41.91	323	37.70	329	35.60	447	47.62
Total overseas [4]	768	19.81	811	18.50	945	18.50	1,248	21.44
Total Army	5,832	25.39	5,645	23.27	7,258	27.23	8,646	29.64

See footnotes at end of table.

APPENDIX TABLE 10.—*Incidence (total cases) of gonorrhea in the U.S. Army, by theater or area and month, 1942*—Continued

Theater or area	September		October		November		December	
	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate
Continental United States	8,565	34.45	9,880	34.43	11,089	35.18	11,868	32.86
Overseas:								
Europe	440	31.20	485	28.10	421	26.54	407	33.58
Mediterranean [1]					102	13.06	622	41.14
Middle East [2]	56	78.65	41	47.79	38	24.89	65	30.62
China-Burma-India [3]	77	67.96	50	33.29	42	29.75	56	39.58
Southwest Pacific	177	21.42	216	23.31	162	18.58	153	16.28
Central and South Pacific	96	5.99	94	5.38	117	6.35	123	6.10
North America	91	8.01	79	6.33	80	6.49	69	5.15
Latin America	439	46.83	474	50.15	390	41.23	467	45.71
Total overseas [4]	1,381	22.09	1,492	21.02	1,453	18.01	2,036	23.38
Total Army	9,946	31.96	11,372	31.77	12,542	31.68	13,904	31.02

[1] North Africa only. No strength in this theater until November.
[2] No strength in this area until June.
[3] No strength in this theater until March.
[4] Includes 516 admissions on transports.

APPENDIX TABLE 11.—*Incidence (total cases) of gonorrhea in the U.S. Army, by theater or area and month, 1943*

[Preliminary data based on sample tabulations of individual medical records]

[Rate expressed as number of cases per annum per 1,000 average strength]

Theater or area	Total		January		February		March		April	
	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate
Continental United States	123,920	23.91	11,215	28.67	10,281	27.15	11,060	24.82	10,875	24.71
Overseas:										
Europe	6,423	24.07	379	37.19	382	43.64	378	41.02	362	39.93
Mediterranean [1]	15,560	34.07	602	29.06	671	32.24	805	30.05	700	23.51
Middle East	1,287	24.26	65	23.77	66	20.79	111	26.57	129	29.61
China-Burma-India	985	24.86	63	45.62	49	32.45	56	30.19	49	21.61
Southwest Pacific	2,184	11.50	171	18.55	167	18.17	216	19.33	182	15.88
Central and South Pacific	1,247	4.28	114	5.61	107	5.89	128	6.19	114	5.54
North America [2]	1,053	5.41	82	5.66	81	6.02	135	8.74	86	5.58
Latin America	4,218	34.91	473	43.94	398	40.82	377	35.55	414	40.76
Total overseas [3]	33,843	20.05	1,994	21.07	1,961	22.24	2,235	21.47	2,065	19.11
Total Army	157,763	22.96	13,209	27.19	12,181	26.22	13,295	24.19	12,940	23.60

See footnotes at end of table.

APPENDIX TABLE 11.—*Incidence (total cases) of gonorrhea in the U.S. Army, by theater or area and month, 1943*—Continued

Theater or area	May		June		July		August	
	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate
Continental United States	10,615	23.19	10,410	23.30	11,405	24.62	10,685	23.35
Overseas:								
Europe	325	31.47	375	28.77	394	21.84	535	24.29
Mediterranean [1]	598	16.11	720	18.64	755	17.59	1,098	24.69
Middle East	124	26.55	135	28.14	102	18.14	126	22.55
China-Burma-India	63	23.39	59	22.78	76	27.61	77	24.06
Southwest Pacific	151	11.82	144	10.29	163	10.14	172	9.60
Central and South Pacific	75	3.32	84	3.67	102	3.93	98	3.87
North America [2]	109	6.34	93	5.44	90	4.53	89	4.70
Latin America	411	38.39	328	32.97	348	33.33	301	28.77
Total overseas [3]	1,899	15.23	1,997	15.63	2,088	14.03	2,552	16.36
Total Army	12,514	21.49	12,407	21.59	13,493	22.05	13,237	21.57

Theater or area	September		October		November		December	
	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate
Continental United States	10,040	23.00	9,220	21.02	9,040	21.82	9,135	22.03
Overseas:								
Europe	604	22.91	795	22.76	880	19.49	1,014	16.98
Mediterranean [1]	1,119	24.02	1,638	32.29	2,872	59.97	3,982	79.17
Middle East	120	24.80	112	24.42	98	22.72	99	23.66
China-Burma-India	121	30.56	103	21.28	122	20.43	147	22.28
Southwest Pacific	150	7.82	169	7.89	235	10.61	264	10.42
Central and South Pacific	68	2.64	94	3.30	114	3.93	149	4.70
North America [2]	90	5.41	69	4.35	65	4.32	64	4.26
Latin America	300	30.30	317	32.48	278	29.01	273	31.20
Total overseas [3]	2,645	16.52	3,374	18.89	4,806	25.72	6,227	29.64
Total Army	12,685	21.26	12,594	20.41	13,846	23.03	15,362	24.59

[1] Includes North Africa.
[2] Includes Alaska and Iceland.
[3] Includes cases on transports.

APPENDIX TABLE 12.—*Admissions for gonorrhea in the U.S. Army, by theater or area and month, 1944* [1]

[Preliminary data based on sample tabulations of individual medical records]

[Rate expressed as number of cases per annum per 1,000 average strength]

Theater or area	Total		January		February		March		April	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Continental United States	117,192	29.51	10,204	25.55	8,540	23.63	8,997	24.15	8,771	25.09
Overseas:										
Europe	36,855	21.98	1,250	17.33	1,095	13.74	1,175	12.14	1,320	12.24
Mediterranean [2]	48,378	74.48	4,045	77.41	3,731	75.68	3,499	65.10	3,259	58.13
Middle East	1,250	27.05	109	26.10	93	23.86	121	31.49	81	22.14
China-Burma-India	2,940	17.43	164	20.04	156	18.73	232	23.36	208	19.19
Southwest Pacific	3,245	6.02	310	11.70	232	8.24	296	9.08	289	7.91
Central and South Pacific	2,021	4.61	216	6.63	171	5.00	211	5.49	190	4.91
North America	1,070	8.28	79	5.35	106	7.98	80	6.06	111	9.35
Latin America	2,800	32.63	284	34.18	251	33.24	249	30.84	214	28.40
Total overseas [3]	101,813	26.66	6,765	29.51	6,094	26.31	6,209	23.63	5,957	21.27
Total Army	219,005	28.11	16,969	27.00	14,634	24.67	15,206	23.94	14,728	23.39

Theater or area	May		June		July		August	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Continental United States	10,142	28.57	10,399	31.03	10,641	31.36	11,266	34.32
Overseas:								
Europe	1,480	11.82	1,670	12.81	1,905	13.16	2,275	14.59
Mediterranean [2]	3,572	60.42	3,495	60.22	4,948	83.04	4,862	85.21
Middle East	102	28.02	89	24.18	121	31.05	95	24.37
China-Burma-India	228	16.49	199	14.20	190	12.34	370	22.91
Southwest Pacific	250	5.94	268	6.19	314	6.35	231	4.53
Central and South Pacific	175	4.49	119	3.10	129	3.47	148	3.82
North America	83	7.15	99	9.25	112	10.77	94	9.58
Latin America	249	33.21	198	28.65	225	32.47	196	28.68
Total overseas [3]	6,355	20.64	6,269	20.21	8,264	24.56	8,555	24.79
Total Army	16,497	24.88	16,668	25.83	18,905	27.97	19,821	29.43

See footnotes at end of table.

Appendix Table 12.—*Admissions for gonorrhea in the U.S. Army, by theater or area and month, 1944* [1]—Continued

Theater or area	September		October		November		December	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Continental United States	10, 208	33. 56	10, 012	33. 94	9, 222	33. 98	8, 790	33. 73
Overseas:								
Europe	4, 355	26. 80	7, 870	43. 58	5, 895	29. 95	6, 565	29. 25
Mediterranean [2]	4, 378	76. 45	4, 415	80. 15	3, 940	81. 86	4, 234	96. 41
Middle East	72	19. 16	106	26. 21	121	32. 09	140	35. 42
China-Burma-India	284	17. 43	335	19. 05	245	13. 32	329	16. 63
Southwest Pacific	275	5. 34	265	4. 65	236	3. 99	279	4. 50
Central and South Pacific	125	3. 27	140	3. 78	291	8. 62	106	3. 27
North America	101	11. 33	68	7. 74	65	7. 82	72	9. 49
Latin America	239	36. 98	245	36. 98	248	38. 36	202	30. 59
Total overseas [3]	10, 005	28. 44	13, 745	36. 78	11, 244	29. 47	12, 301	30. 10
Total Army	20, 263	30. 89	23, 757	35. 53	20, 466	31. 34	21, 091	31. 51

[1] Including CRO.
[2] Includes North Africa.
[3] Includes admissions on transports.

Appendix Table 13.—*Incidence (total cases) of syphilis (including neurosyphilis) in the U.S. Army, by theater or area and month, 1942*

[Preliminary data based on sample tabulations of individual medical records]

[Rate expressed as number of cases per annum per 1,000 average strength]

Theater or area	Total		January		February		March		April	
	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate
Continental United States	19, 109	7. 19	1, 157	8. 60	1, 201	8. 91	1, 310	7. 98	1, 287	7. 44
Overseas:										
Europe	628	7. 57	2	30. 30	2	6. 51	1	1. 14	4	4. 27
Mediterranean [1]	179	7. 81	------	------	------	------	------	------	------	------
Middle East [2]	63	10. 42	------	------	------	------	------	------	------	------
China-Burma-India [3]	65	7. 43	------	------	------	------	------	0	------	0
Southwest Pacific	372	5. 22	------	0	11	20. 00	11	6. 48	47	11. 46
Central and South Pacific	386	2. 56	9	1. 95	26	5. 51	20	3. 24	25	2. 66
North America	160	1. 59	6	1. 94	13	4. 01	14	3. 11	12	2. 26
Latin America	1, 821	17. 87	115	18. 90	121	19. 42	121	16. 35	109	12. 95
Total overseas [4]	3, 738	6. 38	137	8. 61	177	9. 48	179	7. 10	200	6. 11
Total Army	22, 847	7. 05	1, 294	8. 60	1, 378	8. 98	1, 489	7. 86	1, 487	7. 23

See footnotes at end of table.

APPENDIX TABLE 13.—*Incidence (total cases) of syphilis (including neurosyphilis) in the U.S. Army, by theater or area and month, 1942*—Continued

Theater or area	May		June		July		August	
	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate
Continental United States	1,319	6.91	1,272	6.40	1,369	6.35	1,621	6.94
Overseas:								
Europe	16	8.30	14	3.83	52	9.02	71	7.01
Mediterranean [1]								
Middle East [2]			1	22.22	2	6.35	2	4.29
China-Burma-India [3]	5	9.14	8	14.16	4	5.71	7	7.63
Southwest Pacific	31	5.21	32	4.63	31	4.05	31	3.69
Central and South Pacific	27	2.38	38	2.98	50	3.44	36	2.35
North America	6	.90	9	1.16	9	.92	21	1.95
Latin America	134	16.57	146	17.04	145	15.69	175	18.64
Total overseas [4]	227	5.85	253	5.77	297	5.81	344	5.91
Total Army	1,546	6.73	1,525	6.29	1,666	6.25	1,965	6.74

Theater or area	September		October		November		December	
	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate
Continental United States	1,887	7.59	1,998	6.96	2,229	7.07	2,459	6.81
Overseas:								
Europe	91	6.45	140	8.11	122	7.69	113	9.32
Mediterranean [1]					56	7.17	123	8.14
Middle East [2]	9	12.64	11	12.82	14	9.17	24	11.30
China-Burma-India [3]	6	5.30	12	7.99	13	9.21	10	7.07
Southwest Pacific	36	4.36	48	5.18	41	4.70	53	5.64
Central and South Pacific	29	1.81	27	1.54	58	3.15	41	2.03
North America	18	1.58	18	1.44	21	1.70	13	.97
Latin America	202	21.55	190	20.10	183	19.35	180	17.62
Total overseas [4]	391	6.25	451	6.35	520	6.44	562	6.45
Total Army	2,278	7.32	2,449	6.84	2,749	6.94	3,021	6.74

[1] North Africa only. No strength in this theater until November.
[2] No strength in this area until June.
[3] No strength in this area until March.
[4] Includes 64 admissions on transports.

APPENDIX TABLE 14.—*Incidence (total cases) of syphilis (including neurosyphilis) in the U.S. Army, by theater or area and month, 1943*

[Preliminary data based on sample tabulations of individual medical records]

[Rate expressed as number of cases per annum per 1,000 average strength]

Theater or area	Total		January		February		March		April	
	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate
Continental United States	91, 910	17. 73	3, 200	8. 18	3, 760	9. 99	5, 770	12. 95	7, 235	16. 44
Overseas:										
Europe	2, 501	9. 37	108	10. 59	89	10. 16	105	11. 40	112	12. 35
Mediterranean [1]	3, 610	7. 90	186	8. 98	156	7. 50	198	7. 39	225	7. 56
Middle East	755	14. 23	38	13. 90	41	12. 92	50	11. 97	35	8. 03
China-Burma-India	583	14. 72	15	10. 86	18	11. 92	29	15. 64	22	9. 70
Southwest Pacific	621	3. 27	54	5. 86	40	4. 35	59	5. 28	68	5. 93
Central and South Pacific	442	1. 52	38	1. 87	40	2. 20	30	1. 45	31	1. 50
North America [2]	297	1. 53	23	1. 59	20	1. 48	22	1. 42	27	1. 75
Latin America	1, 756	14. 53	229	21. 27	176	18. 06	201	18. 95	188	18. 51
Total overseas [3]	10, 665	6. 32	698	7. 37	584	6. 62	698	6. 70	713	6. 60
Total Army	102, 575	14. 93	3, 898	8. 02	4, 344	9. 35	6, 468	11. 76	7, 948	14. 50

Theater or area	May		June		July		August	
	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate
Continental United States	8, 010	17. 51	7, 545	16. 88	7, 115	15. 36	7, 790	17. 03
Overseas:								
Europe	149	14. 43	143	10. 97	153	8. 48	205	9. 31
Mediterranean [1]	240	6. 47	217	5. 61	239	5. 57	275	6. 19
Middle East	53	11. 35	66	13. 76	78	13. 87	75	13. 42
China-Burma-India	38	14. 11	35	13. 51	33	11. 98	50	15. 62
Southwest Pacific	47	3. 68	49	3. 50	42	2. 61	45	2. 51
Central and South Pacific	51	2. 26	27	1. 18	45	1. 73	23	. 91
North America [2]	30	1. 74	31	1. 82	30	1. 51	29	1. 53
Latin America	170	15. 88	139	13. 97	110	10. 54	118	11. 28
Total overseas [3]	786	6. 31	714	5. 59	733	4. 93	826	5. 29
Total Army	8, 796	15. 11	8, 259	14. 37	7, 848	12. 82	8, 616	14. 04

See footnotes at end of table.

APPENDIX TABLE 14.—*Incidence (total cases) of syphilis (including neurosyphilis) in the U.S. Army, by theater or area and month, 1943*—Continued

Theater or area	September		October		November		December	
	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate
Continental United States	9,215	21.11	10,435	23.79	11,290	27.25	10,545	25.43
Overseas:								
Europe	278	10.54	295	8.44	409	9.06	455	7.62
Mediterranean [1]	416	8.93	425	8.38	464	9.69	569	11.31
Middle East	74	15.30	93	20.28	80	18.54	72	17.21
China-Burma-India	68	17.18	83	17.15	93	15.58	99	15.00
Southwest Pacific	54	2.81	59	2.75	53	2.39	51	2.02
Central and South Pacific	47	1.82	34	1.20	35	1.20	41	1.29
North America [2]	21	1.26	26	1.64	22	1.46	16	1.06
Latin America	104	10.50	117	11.98	121	12.63	83	9.48
Total overseas [3]	1,066	6.65	1,138	6.37	1,307	7.00	1,402	6.67
Total Army	10,281	17.23	11,573	18.75	12,597	20.96	11,947	19.12

[1] Includes North Africa.
[2] Includes Alaska and Iceland.
[3] Includes cases on transports.

APPENDIX TABLE 15.—*Admissions for syphilis (including neurosyphilis) in the U.S. Army, by theater or area and month, 1944* [1]

[Preliminary data based on sample tabulations of individual medical records]

[Rate expressed as number of cases per annum per 1,000 average strength]

Theater or area	Total		January		February		March		April	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Continental United States	66,685	16.79	10,384	26.00	8,368	23.15	7,456	20.02	8,653	24.76
Overseas:										
Europe	9,445	5.63	460	6.38	470	5.90	660	6.82	665	6.17
Mediterranean [2]	9,533	14.68	618	11.83	684	13.87	784	14.59	762	13.59
Middle East	559	12.10	46	11.02	40	10.26	62	16.13	46	12.57
China-Burma-India	2,428	14.39	122	14.91	166	19.93	227	22.86	182	16.79
Southwest Pacific	1,553	2.88	67	2.53	117	4.16	117	3.59	120	3.29
Central and South Pacific	1,203	2.74	70	2.15	80	2.34	111	2.89	92	2.38
North America	327	2.53	25	1.61	30	2.26	29	2.20	38	3.20
Latin America	1,119	13.04	76	9.15	92	12.18	129	15.98	126	16.72
Total overseas [3]	26,331	6.89	1,496	6.53	1,689	7.29	2,127	8.09	2,043	7.29
Total Army	93,016	11.94	11,880	18.90	10,057	16.96	9,583	15.09	10,696	16.99

See footnotes at end of table.

APPENDIX TABLE 15.—*Admissions for syphilis (including neurosyphilis) in the U.S. Army, by theater or area and month, 1944*[1]—Continued

Theater or area	May		June		July		August	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Continental United States	6,984	19.67	5,462	16.30	4,273	12.59	3,685	11.23
Overseas:								
Europe	655	5.23	575	4.41	595	4.11	500	3.21
Mediterranean [2]	830	14.04	762	13.13	931	15.62	1,076	18.86
Middle East	38	10.44	36	9.78	32	8.21	26	6.67
China-Burma-India	167	12.08	222	15.85	208	13.51	225	13.93
Southwest Pacific	100	2.38	124	2.86	148	2.99	166	3.26
Central and South Pacific	100	2.57	86	2.24	103	2.77	113	2.92
North America	38	3.27	19	1.78	23	2.21	31	3.16
Latin America	123	16.41	71	10.27	89	12.84	77	11.27
Total overseas [3]	2,053	6.67	1,913	6.17	2,147	6.38	2,222	6.44
Total Army	9,037	13.63	7,375	11.43	6,420	9.50	5,907	8.77

Theater or area	September		October		November		December	
	Number	Rate	Number	Rate	Number	Date	Number	Rate
Continental United States	3,126	10.28	2,894	9.81	2,620	9.66	2,780	10.67
Overseas:								
Europe	710	4.37	1,170	6.48	1,395	7.09	1,590	7.08
Mediterranean [2]	868	15.16	677	12.29	711	14.77	830	18.90
Middle East	49	13.04	39	9.64	80	21.21	65	16.44
China-Burma-India	245	15.04	258	14.67	162	8.81	244	12.34
Southwest Pacific	154	2.99	109	1.91	109	1.84	222	3.58
Central and South Pacific	164	4.30	87	2.35	96	2.84	101	3.11
North America	15	1.68	35	3.98	19	2.28	25	3.30
Latin America	59	9.13	61	9.21	88	13.61	128	19.38
Total overseas [3]	2,278	6.67	2,465	6.60	2,675	7.01	3,223	7.89
Total Army	5,404	8.24	5,359	8.01	5,295	8.11	6,003	9.97

[1] Including CRO.
[2] Includes North Africa.
[3] Includes admissions on transports.

Appendix Table 16.—*Incidence (total cases) of chancroid in the U.S. Army, by theater or area and month, 1942*

[Preliminary data based on sample tabulations of individual medical records]

[Rate expressed as number of cases per annum per 1,000 average strength]

Theater or area	Total		January		February		March		April	
	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate
Continental United States	6,465	2.43	481	3.57	388	2.88	456	2.78	477	2.76
Overseas:										
Europe	133	1.60		0		0		0		0
Mediterranean [1]	299	13.04								
Middle East [2]	141	23.32								
China-Burma-India [3]	246	28.13						0		0
Southwest Pacific	71	1.00		0	1	1.82	1	.59	10	2.44
Central and South Pacific	115	.76	25	5.41	10	2.12	11	1.78	5	.53
North America	28	.28	2	.65		0	2	.44	1	.19
Latin America	3,007	29.50	167	27.44	150	24.07	215	29.05	216	25.66
Total overseas [4]	4,114	7.02	209	13.13	165	8.84	233	9.24	243	7.42
Total Army	10,579	3.26	690	4.58	553	3.60	689	3.64	720	3.50

Theater or area	May		June		July		August	
	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate
Continental United States	401	2.10	492	2.47	462	2.14	571	2.45
Overseas:								
Europe	3	1.56	3	.82	5	.87	16	1.58
Mediterranean [1]								
Middle East [2]				0	2	6.35	6	12.88
China-Burma-India [3]	2	3.66	2	3.54	11	15.71	19	20.70
Southwest Pacific	7	1.18	4	.58	8	1.04	1	.12
Central and South Pacific	9	.79	16	1.25	16	1.10	14	.91
North America		0	8	1.04	8	.82	3	.28
Latin America	237	29.30	242	28.25	257	27.81	318	33.88
Total overseas [4]	271	6.99	279	6.37	321	6.28	377	6.48
Total Army	672	2.93	771	3.18	783	2.94	948	3.25

See footnotes at end of table.

APPENDIX TABLE 16.—*Incidence (total cases) of chancroid in the U.S. Army, by theater or area and month, 1942*—Continued

Theater or area	September		October		November		December	
	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate
Continental United States	607	2.44	691	2.41	657	2.08	782	2.17
Overseas:								
Europe	25	1.77	27	1.56	30	1.89	24	1.98
Mediterranean [1]					18	2.31	281	18.59
Middle East [2]	37	51.97	26	30.30	35	22.92	35	16.49
China-Burma-India [3]	77	67.96	55	36.62	38	26.91	42	29.68
Southwest Pacific	7	.85	6	.65	15	1.72	11	1.17
Central and South Pacific	2	.12	1	.06	1	.05	5	.25
North America		0		0	2	.16	2	.15
Latin America	287	30.61	338	35.76	272	28.76	308	30.15
Total overseas [4]	435	6.96	454	6.40	416	5.15	711	8.16
Total Army	1,042	3.35	1,145	3.20	1,073	2.71	1,493	3.33

[1] North Africa only. No strength in this theater until November.
[2] No strength in area until June.
[3] No strength in this theater until March.
[4] Includes 74 admissions on transports.

APPENDIX TABLE 17.—*Incidence (total cases) of chancroid in the U.S. Army, by theater or area and month, 1943*

[Preliminary data based on sample tabulations of individual medical records]

[Rate expressed as number of cases per annum per 1,000 average strength]

Theater or area	Total		January		February		March		April	
	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate
Continental United States	8,190	1.58	785	2.01	715	1.90	680	1.53	765	1.74
Overseas:										
Europe	584	2.19	20	1.96	20	2.28	24	2.60	18	1.99
Mediterranean [1]	8,076	17.68	345	16.65	366	17.59	575	21.47	576	19.34
Middle East	1,331	25.09	47	17.19	72	22.68	112	26.81	109	25.02
China-Burma-India	616	15.55	25	18.10	28	18.54	46	24.80	19	8.38
Southwest Pacific	78	.41	12	1.30	6	.65	8	.72	7	.61
Central and South Pacific	36	.12	4	.20	2	.11	6	.29	7	.34
North America [2]	33	.17	1	.07	8	.59	7	.45	2	.13
Latin America	1,358	11.24	258	23.97	188	19.28	176	16.59	170	16.74
Total overseas [3]	12,235	7.25	719	7.60	699	7.93	960	9.22	936	8.66
Total Army	20,425	2.97	1,504	3.10	1,414	3.04	1,640	2.98	1,701	3.10

See footnotes at end of table.

APPENDIX TABLE 17.—*Incidence (total cases) of chancroid in the U.S. Army, by theater or area and month, 1943*—Continued

Theater or area	May		June		July		August	
	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate
Continental United States	850	1.86	835	1.87	825	1.78	735	1.61
Overseas:								
Europe	19	1.84	45	3.45	64	3.55	71	3.22
Mediterranean [1]	409	11.02	499	12.92	600	13.98	789	17.74
Middle East	106	22.69	103	21.47	121	21.52	149	26.66
China-Burma-India	19	7.06	45	17.37	47	17.07	35	10.94
Southwest Pacific	5	.39	4	.29	9	.56	8	.45
Central and South Pacific	5	.22	3	.13	----------	0	2	.08
North America [2]	6	.35	1	.06	2	.10	1	.05
Latin America	160	14.94	84	8.44	72	6.90	50	4.78
Total overseas [3]	735	5.89	787	6.16	916	6.16	1,109	7.11
Total Army	1,585	2.72	1,622	2.82	1,741	2.84	1,844	3.01

Theater or area	September		October		November		December	
	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate
Continental United States	470	1.08	520	1.19	520	1.26	490	1.18
Overseas:								
Europe	75	2.85	86	2.46	63	1.40	79	1.32
Mediterranean [1]	654	14.04	601	11.85	893	18.65	1,769	35.17
Middle East	148	30.59	148	32.27	120	27.82	96	22.94
China-Burma-India	46	11.62	69	14.25	107	17.92	130	19.70
Southwest Pacific	6	.31	6	.28	3	.14	4	.16
Central and South Pacific	1	.04	5	.18	1	.03	----------	0
North America [2]	2	.12	----------	0	1	.07	2	.13
Latin America	63	6.36	56	5.74	50	5.22	31	3.54
Total overseas [3]	1,000	6.24	975	5.46	1,282	6.86	2,117	10.08
Total Army	1,470	2.46	1,495	2.42	1,802	3.00	2,607	4.17

[1] Includes North Africa.
[2] Includes Alaska and Iceland.
[3] Includes cases on transports.

APPENDIX TABLE 18.—*Admissions for chancroid in the U.S. Army, by theater or area and month, 1944* [1]

[Preliminary data based on sample tabulations of individual medical records]

[Rate expressed as number of cases per annum per 1,000 average strength]

Theater or area	Total		January		February		March		April	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Continental United States	3,174	0.80	498	1.25	446	1.23	379	1.02	348	1.00
Overseas:										
Europe	2,500	1.49	90	1.25	65	.82	80	.83	70	.65
Mediterranean [2]	17,020	26.20	2,068	39.57	192	38.78	1,492	27.76	1,391	24.81
Middle East	811	17.55	114	27.30	82	21.04	78	20.30	74	20.22
China-Burma-India	1,855	11.00	168	20.53	129	15.49	150	15.11	155	14.30
Southwest Pacific	81	.15	4	.15	2	.07	6	.18	11	.30
Central and South Pacific	65	.15	4	.12	4	.12	2	.05	2	.05
North America	8	.06	--------	0	--------	0	3	.23	3	.25
Latin America	145	1.69	24	2.95	15	1.99	19	2.35	18	2.39
Total overseas [3]	22,526	5.90	2,478	10.81	2,214	9.56	1,832	6.97	1,730	6.18
Total Army	25,700	3.30	2,976	4.73	2,660	4.49	2,211	3.48	2,078	3.30

Theater or area	May		June		July		August	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Continental United States	266	0.75	231	0.69	211	0.62	225	0.69
Overseas:								
Europe	40	.32	----------	0	50	.35	50	.32
Mediterranean [2]	1,366	23.11	1,182	20.36	1,691	28.38	1,488	26.08
Middle East	52	14.29	34	9.24	35	8.98	39	10.01
China-Burma-India	131	9.47	134	9.56	140	9.09	138	8.55
Southwest Pacific	3	.07	6	.14	8	.16	4	.08
Central and South Pacific	----------	0	4	.10	2	.05	----------	0
North America	----------	0	----------	0	1	.10	1	.10
Latin America	12	1.60	22	3.18	16	2.31	6	.88
Total overseas [3]	1,606	5.22	1,382	4.46	1,947	5.79	1,730	5.01
Total Army	1,872	2.82	1,613	2.50	2,158	3.19	1,955	2.90

See footnotes at end of table.

APPENDIX TABLE 18.—*Admissions for chancroid in the U.S. Army, by theater or area and month, 1944* [1]—Continued

Theater or area	September		October		November		December	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Continental United States	156	0. 51	139	0. 47	146	0. 54	129	0. 50
Overseas:								
Europe	400	2. 46	505	2. 80	470	2. 39	680	3. 03
Mediterranean [2]	1, 292	22. 56	1, 125	20. 42	936	19. 45	1, 077	24. 52
Middle East	61	16. 23	90	22. 25	77	20. 42	75	18. 97
China-Burma-India	197	12. 09	161	9. 15	164	8. 92	188	9. 50
Southwest Pacific	5	. 10	6	. 10	5	. 08	21	. 34
Central and South Pacific	----------	0	6	. 16	19	. 56	22	. 68
North America	----------	0	----------	0	----------	0	----------	0
Latin America	2	. 31	6	. 91	4	. 62	1	. 15
Total overseas [3]	1, 958	5. 57	1, 901	5. 09	1, 680	4, 40	2, 068	5. 06
Total Army	2, 114	3. 22	2, 040	3. 05	1, 826	2. 80	2, 197	3. 28

[1] Including CRO.
[2] Includes North Africa.
[3] Includes admissions on transports.

Index

559625v—61——35

U.S. GOVERNMENT PRINTING OFFICE: 1961